SOCIETY FOR THE ENCOURAGEMENT OF ARTS, MANUFACTURES, & COMMERCE,
JOHN-STREET, ADELPHI, LONDON, W.C.

HEALTH AND SEWAGE OF TOWNS.

CONFERENCE,

THURSDAY and FRIDAY, 23rd & 24th MAY,
1878.

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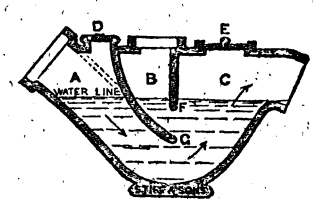

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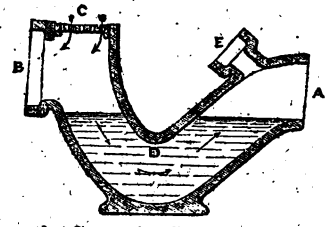

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JOHN-STREET, ADELPHI, LONDON, W.C.

HEALTH AND SEWAGE OF TOWNS.

CONFERENCE,

THURSDAY and FRIDAY, 23rd & 24th MAY, 1878.

EXECUTIVE COMMITTEE.

Lord Alfred Churchill.
Sir Henry Cole, K.C.B.
Col. Sir E. Du Cane, K.C.B.

Capt. Douglas Galton, C.B., F.R.S.
F. A. Abel, C.B., F.R.S.
T. W. Keats.

Dr. Voelcker, F.R.S.
W. Hawes, F.G.S.
Major-General Fred. Cotton, R.E., C.S.I.

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PRINTED BY W. TROUNCE, 10, GOUGH SQUARE, FLEET STREET.

1878.

Price Two Shillings.

CONFERENCE

ON

THE HEALTH AND SEWAGE OF TOWNS.

23rd and 24th MAY, 1878.

The Conference on Health and Sewage of Towns was held on Thursday and Friday, the 23rd and 24th May, the Right Hon. JAMES STANSFELD, M.P., in the chair. The programme of proceedings was as follows:—

Thursday, 11 a.m.—Opening of the Proceedings by the Chairman.

Papers and Discussions on—

1st. Gradual Abolition of Cesspools and Middens, and Substitution of Tubs and Pails, with speedy removal.

2nd. Progress, if any, made in Treating Water-caried Sewage since the last Congress.

3rd. Escape of Sewage Gas into Dwellings, and Modes of Prevention.

4th. Progress, if any, made in the Utilisation of Excreta since the last Conference.

5th. Discharge of Sewage into Sea.

6th. Cost of Systems given in the last Report of the Local Government Board.

Friday, 11 a.m.

7th. Whether any further Legislation, of a Compulsory or Permissive Character, is needed for bringing about a better Sanitary Condition of Towns or Dwellings, or any Change in Imperial Administration.

The Chairman, in opening the proceedings, said he had great pleasure in acceding to the request of the Council asking him to preside at its third annual Conference on the subject of the health of towns, with special reference to the question of sewage. He must commence by an apology and an excuse, for the truth was that when he accepted the invitation some two or three months ago, he had forgotten to record another engagement on the same day. He had endeavoured to make the best arrangement he could, and would have to ask the meeting to excuse him, after his opening remarks, for the rest of the morning; but he had arranged to be present in the afternoon, and the whole day to-morrow. He especially desired to be present then, because he hoped that they would get through the first six heads of discussions on that day, and deal to-morrow with the seventh, which was one of a novel and very special and important character, upon which, from his official experience, he hoped to be able to throw some light. They had seen enough of these Conferences to be satisfied with their utility, and he hoped that they would continue; but in expressing that hope, he was inclined to add that he thought the time had come when they might advisedly somewhat enlarge the programme and scope of their discussion. At present the subject was the Health and Sewage of Towns, and that had been interpreted as meaning the health of towns as affected by sewage arrangement; but they had just had a Congress sitting for two days on the question of water supply, which was intimately connected with the question of the sewage of towns, and the health of towns, and their relations with each other. So far was that evident, that he found amongst the printed papers two which ought really to have been laid before the Congress which had just concluded its sitting, namely, those by Mr. Robinson and Dr. Bond, their subject being the Public Health Act Amendment Bill of this year, which bore on the question of water supply of small communities. He saw no reason for refusing to receive those papers, but their presence rather showed the desirability of enlarging the scope of their inquiry. He had spoken to Mr. Brown, M.P., on the subject, and requested his presence, but he was not able to be with them on that day, but had furnished him with a letter in which he gave his views, and the views of the Committee, with regard to one of the questions raised in the paper of Dr. Bond, and those views he should be able to lay before the Conference. He thought, however, they should widen the scope of these discussions to the larger question of the health of towns as affected by local government arrangements, because that seemed to be a fair subject matter for further Conferences, and would still only be a part, and, possibly, not the largest part, of a much larger question, namely, that of national health. With reference to all the causes of national health or disease, and to the influences which affected that health one way or the other, health, viewed in that large sense, might perhaps be defined as depending upon activity, moderation, and temperance, sufficiency of supply for the waste of life, and cleanli-

ness. Activity was necessary to health, in fact, life meant activity, and there was no health which did not mean vigorous life. He need not say that a sufficiency of those supplies which were necessary for the food either of the mind or body, was a necessary part of the causes of health. Moderation and temperance were a cause of health, because all excess, of whatever kind, was against the laws of nature, and, therefore, against the laws of health. Lastly, cleanliness was a great source of health, and here it was that the functions of local government came in. What they wanted was clean air to breathe, clean water to drink, clean persons, clean habits, clean houses. Local governments could do a great deal, but not everything which had to be done in this direction. They could secure good pure water, they could bring it into every human habitation in their district; they could, although they had not yet got sufficient power, take efficient security that that sufficient supply of pure water should not be subsequently fouled or contaminated by ill-conditioned cisterns or by sewer gas. Those subjects had been discussed at the two previous annual Conferences, and they arrived at distinct conclusions, which were drawn out afterwards by the committee of the Society. They then expressed the view that, by legislation, as far as might be necessary, local authorities should have imposed on them the duty of having such control over the pipes of the house itself, as also over the drains in the street, as should enable them to fulfil their implied contract with the inhabitants of enabling them to drain the refuse of their houses away without being invaded, by way of return, by the gas created in the sewers into which they drained. Local governments could do a great deal to prevent pollution, within the dwelling, of the air which was supplied from without; they could not in the manufacturing towns, where the air was heavily laden with smoke, or it might be with the products of chemical processes, supply the pure air of the mountain top; that was an ideal consummation to which they could hardly look forward, but taking the air as it was met with outside the house, they could take efficient precautions to secure to the inhabitants of a town this advantage at least, that that air should not be lowered in quality, and contaminated either by bad sites formed of unwholesome materials and refuse, by damp walls, by want of air space around the dwellings, or by the inflow of sewer gas. But they could not compel internal ventilation. If people preferred to shut their windows instead of keeping them open, and preferred close foul air to pure, it was impossible for a local government to have a policeman in every dwelling to see that people were wise instead of foolish in respect of the ventilation of their homes. They could not secure cleanliness of person, nor what he should call cleanliness of life and habit. All these things were matters of education, and what he desired to impress on the meeting was this, that, largely viewed, the question of health was very much a question of education, and he looked forward to the day when local government should be further advanced and better understood by the community at large; when the education of the young should be in the hands of the ordinary local government of every locality or community; for he believed it to be the true future of local government to accumulate all the functions of government in one body for one area. When that time came, he trusted the elementary truths of the science of national health would be considered as an essential part of national education, and would be taught in the schools of the community as much as the three R's. This was the third annual Conference, and he might remind them of the conclusions to which they came last year.* After quoting these conclusions, the Chairman said he had already referred to a new and particularly interesting subject for discussion this year, namely, the legislative and imperial administrative question. The desirability of discussing questions of legislative improvement was raised at the last Congress by General Cotton, and towards the close of the Congress he himself suggested that the subject of further legislation might be considered this year, and went on to recommend his auditors to make themselves acquainted with the existing state of the law before beginning the discussion. He hoped that recommendation had been attended to, and that they were all conversant with the Public Health Consolidation Act, of which he had brought a copy, so that it might be referred to if necessary. Another branch of the subject was the question of a change in imperial administration, and it was especially about that that he thought it was really his duty to be present during that part of the discussion, because if he knew anything he must know something about that subject, having passed the Public Health Act, which constituted all existing sanitary authorities. He passed the Act which transformed the Poor-law Board into the Local Government Board, and was its first President, and he entertained clear and decided views as to the functions and limits of imperial supervision, and as to the method by which that imperial supervision should be brought about and administered. He should, therefore, feel bound to contribute as well as he could to the discussion, and to speak fully and frankly with all the knowledge he had acquired from his experience. He would now call upon the meeting to discuss the first question on the programme, namely, "Gradual Abolition of Cesspools and Middens, and Substitution of Tubs and Pails, with Speedy Removal."

Mr. Stansfeld then withdrew and Sir Henry Cole took the chair.

Sir Henry Cole said the first paper on the list was by Alderman Taylor, referring to the Rochdale system, but he believed Mr. Taylor was not present.

Mr. Schofield said he represented Rochdale, and he thought the paper should be read, or else it could not be properly discussed.

The Chairman said Mr. Schofield had better state the substance of the paper.

Mr Schofield said they had now been for some years past carrying out the pail system in Rochdale, and from Alderman Taylor's paper it would be seen how rapidly the system had been growing, so that there were now 7,504 closets adapted to the new system. There were about 14,000 houses in the town, and more than half were on the new system. This had been done entirely without resort to compulsion of any kind until within the last two months, and they had only done that because having here and there a house on the old system in particular streets greatly increased the cost of collection, when carts had to go from one street to another. For that reason they had required the inhabitants of particular districts to adapt the whole of their closets to the new system. The great difficulty from the beginning had been the manufacture of the excreta into manure, which would be saleable, so as not to involve too great a cost to the town. At first the manure made was of low value, and would not bear the cost of transit. Their object had been for a long time to effect some mode of drying so as to greatly reduce the bulk and improve the quality. It would be seen by reference to the printed table that they had now two machines which reduce 14 tons of material collected to 1 ton 3 cwt., there being added 25 lbs. of sulphuric acid to each ton. Then followed the detailed analysis of the dry product, a specimen of which might be seen in the adjoining room. It very much resembled good guano, and was worth £6 or £7 a ton. The fact that they had been able to reduce the bulk and weight to so large an extent as to produce a manure of great value were the facts to which he wished to call the special attention of the Congress.

* See *Journal*, vol. xxv., p. 902.

Mr. Edwin Chadwick, C.B., asked what the cost was and how often the stuff was removed?

Mr. Schofield said weekly.

Mr. Haresceugh said the cost of removal was about £1 per house per annum.

Mr. Green asked what was done with the domestic slops and storm waters, and what was the cost of disposing of them?

Mr. Schofield said they did not deal with the water question at all, but simply the excreta from the closets, and the ashes. In reply to Mr. Chadwick, he added that there was a distinct system of sewers to carry away the house slops. This at present went into the river; they were making arrangements to take it out, but had not yet succeeded.

Colonel Jones asked the price per ton at which this was sold, and whether it was sold under a guaranteed analysis?

Mr. Haresceugh said it was selling at present at £6 10s. per ton. They had far more orders than they could supply. The guaranteed analysis was from 9 to 10 per cent. of ammonia, 6 to 7 per cent. of phosphate of lime, and about 12 per cent. of alkaline salts. For a long time they had been trying to bring out a manure which would not only sell well, but would enable them to get rid of the stuff being sent off in a crude state, mixed with ashes, but by that method they had to take it away into Cheshire, and dispose of it at 3s. a ton; consequently it was a losing game, because they had 2s. 4d. to pay for carriage, besides the expense of carting it to the station; therefore it was a great loss. They had now got two machines at work, he did not say they were perfect, but he believed they would make them so. At present they would work about 14 tons per day, but when they got more steam power they would be able to do much more. To get rid of 10 tons of the excreta in a crude state they would require to mix it with 14 tons of ashes, so that they would have to send away 24 tons a day in the way of crude excreta, which would cost them at least 2s. a ton to get rid of, besides what they received for the manure, but 10 tons of that stuff did not yield under the improved process more than about 16 cwt. of finished manure, which was worth 6s. 6d. per cwt., and the amount of labour required was much less than that required in the crude state, therefore there was a saving of labour, and the manure was worth something when it was done. There had also been a great difficulty in getting rid of the great quantity of crude material from the old ashpits; in fact they had to beg people to accept of it. They had now about 1,200 of these old closets, which they were rapidly doing away with. Another important point was this, that they could do it all in a cleanly way. Their manufactory was as free from smell as that room. When they had the stuff piled up in great heaps it was unsightly and offensive but now the place was whitewashed and kept clean and sweet. In fact, he could prepare the stuff next door to anyone's house, and he would not know it was there.

Mr. J. M. Fox said the essential principle of his paper was that excreta should be dealt with at once and by the individual. He was glad of the interesting discussion on the Rochdale system, because it gave him an opportunity to pay a tribute of praise to Rochdale for having been the pioneer with reference to the pail system and dry method. At the same time he wished to say, in the most unqualified manner, that Rochdale, as a large town, had made a most complete mistake, and the same with Manchester and Halifax, in adopting the dry system. He gave Rochdale credit for having made experiments in this matter, which had been useful to rural districts and small villages and hamlets, but he thought it was quite a mistake for any large town with sewers and water supply, to be satisfied with the dry method. He was much struck with a remark made by the Premier, in his speech at the Royal Academy dinner, that civilisation was essentially comfortable. Now, the dry method, he contended, was essentially uncomfortable for a town. The water-closet was the only comfortable method with which at present English civilisation would be satisfied. Yesterday we had dealt with the purity of water, and the Chairman had dealt with the purity of air. Now, excrement was the worst source of pollution of both, and the most injurious kind was human excrement. He contended, therefore, that we must not be timid in grappling with the very beginning of this matter, and the beginning was with individual convictions. It was very easy to talk about dealing with excreta on a large scale, but it did not sound so well to talk about individual action and duty in this matter. People are not at all afraid of talking about engineering arrangements for big towns, but anything like a personal responsibility is lost sight of. His experience had been very much in rural districts, although he had had the management in point of health of sewered towns. The greater part of his work had been in small villages where there were no sewers and no water supply, and where, therefore, the water carriage method could not be obtained. The first thing was to do something. He was told, when he went into Cumberland, that the colliers did not want privies, but he suggested that even colliers had wives and daughters, and that they should not be relegated to the same rural practice as the men. Thus, by degrees, he got boards of guardians and colliery owners to see that a different arrangement must be made from that which had prevailed. The principle of his paper was one suggested by the consideration of the practice imposed upon a nation still in existence, whose first legislator had universal credit as having been the prince amongst legislators, and Moses was not timid in this matter. He did not content himself simply with laws appertaining to national defence, with art, or religion, or commerce, but he dealt with this matter by making a sanitary regulation which was binding on the individual. He had been glad to listen to the remarks of the former President of the Local Government Board on the subject of education, who considered that there must be a great deal of education in connection with subjects bearing on the public health. If this idea of individual obligation had been put before the people they might have been more advanced in education in this respect. He should like every person to feel that, if he deposited a nuisance anywhere, and left it to pollute the air, he did a wrong, and made no attempt at reparation for it. Now, with the water-closet system you did make a reparation. When the nuisance was committed, the handle was lifted up and it was removed. He was quite prepared to admit that they had not yet, in practice, got the sewers into a perfect condition, or a complete provision against sewer gas; but it must be remembered that the defects in carrying out a system still in its infancy were no argument against the principle. When a man used a closet he made reparation in the way he had spoken of. In the dry method he contended that something similar should be done. The requirement he had made at Cockermouth was, therefore, that ashes should be sifted on the *dejecta* each day. If Rochdale or any other town could not make its sewage pay without keeping it just as it was in a crude state, he said that system was a nuisance and an abomination, and the commercial principle, which was carefully excluded from the discussion with regard to the supply of water, must not enter into this question at all. The very temptation which existed with a dry method, to look at the commercial aspect of the question and give a good balance-sheet, and the utter impossibility of doing so by a sensible mode of procedure, was an argument against the adoption of that method on a large scale. The natural mode of dealing with excreta was either to

remove it and get it away, or to deal with it in the way of disinfection. Let it be covered up with earth or ashes, but it must be done at once, and must not be left a week to pollute the curtilage, because, unless it was undealt with, it would not sell. He would not say that dry earth was absolutely necessary, for ashes would do, as they absorbed the urine and prevented very much of the putrefactive fermentation. The paper had not only touched upon this principle, but also dealt with an addition to the law in conformity with the view expressed therein. He thought it should be defined in the statute clearly when a privy was a nuisance and when it was not. A privy was a nuisance when the excreta were uncovered. As the law stood at present it was difficult to decide whether a privy was a nuisance or not, or to say what was the maximum smell beyond which it became a nuisance. It depended very much on the olfactory organs of the inspector, but he thought we should get out of the region of opinion and into the region of fact; therefore he had made the suggestion to be found at the close of his paper. The remarks of the Chairman brought to his mind the arrangements in schools, and he thought it was very important that children should be taught what is right in these matters; and that hygienic observances should not be lost sight of in determining the character of a school.

Dr. Wilson (Rochdale) wished to make a remark on the rather exaggerated statements of the last speaker. He said the authorities in Rochdale had made a fatal mistake in adopting the dry system. Granting that were so, it was a mistake which they made in common with some of the largest and most important cities in England, such as Manchester, Birmingham, Sheffield, and Leicester, and he thought it was only true to say that the authorities of those towns, when they first considered this question, had the primary interest of the inhabitants at heart, and that it was not a mere question of pounds, shillings, and pence with them. But there was another point with regard to Rochdale. If they, when the question of how best to deal with the change from the old middens was first discussed, had adopted the water-closet system, where were they to get the water from? In 1867 they were in this position, that water-carts had to be sent through the streets, and water was obtained from temporary sources to supply the ordinary wants of the inhabitants. With regard to this system being a nuisance and abomination, and so on, he thought the best answer would be to ask what were the results on the health of the inhabitants, and the sanitary condition of the town; and it was a singular coincidence that ever since this system was introduced, in 1870, there had been a continuous lessening of the death-rate. They dealt with the excreta on the principle mentioned in Mr. Taylor's paper, viz., that it was not to be allowed to become offensive to the people, neither when deposited nor in its collection. They did not manufacture it into manure as a commercial speculation, but because they could not otherwise get rid of it. He could thoroughly bear out the statement they had heard that morning, as to the mode in which it was dealt with, that there was no nuisance at the works, and it so happened that this method of dealing with it also produced a valuable product, but that was not the essential thing with the authorities. The death-rate was formerly very high, 27 per 1,000. In the first three years after the introduction of this system, it fell to 24, in the sixth year to 22, and last year it was under 21 per 1,000. For a large manufacturing town, having about 71,000 inhabitants, that was a good test, and it was creditable to the authorities to have done so much. He could speak with the more freedom on this point because the greater part of this reform was carried out before he went to Rochdale as medical officer of health there. It must also be remembered that, dealing with the excreta was only part of the Rochdale system. They also dealt with the dry refuse—that from slaughterhouses, fishmongers, and so on, which the best water-closet system must still leave untouched.

Mr. Williams (Liverpool) said there were five systems at present of getting rid of excreta. Mr. Fox's favourite appeared to be the Mosaic, but he did not think that was likely to make any progress at present. The second was the pail system, and that was, to his mind, so disgusting as to make it almost difficult to write the word. The third was the earth-closet, which was an improvement, but that again would have to go into the hospital; it could not survive. The fourth was the water-closet and water-carriage system, and that was the best of the four, to his mind. But that again would have to go into limbo. The previous day he had had an opportunity of making a few remarks on sewage and sewer gas, and how readily that gas found its way into houses, and therefore the fifth system, the Liernur system, he considered the best.

Dr. Fox said he had been slightly misunderstood. He merely referred to Moses as laying down a principle, and did not advocate the carrying out of the exact plan he had described. He should be sorry for any gentleman from Rochdale to think that he suggested that, because cost was the first element of consideration. No doubt it was for the protection of the public health, but he felt that cost was so mixed up with the way in which they had to carry it out, that it hampered them very much. As to the improvement in Rochdale, he was perfectly certain that if any town would abolish its old filthy privies, and adopt any system whatever, there must be an improvement in the health.

The Chairman drew attention to the description amongst the printed papers of the Chinese system, and added that until the last 150 years human excrement had gone on to the land as best it could in England. The report of the Rivers Pollution Commission stated that men ought to be the best farming stock we had; that the excrement of a sheep was worth at least 5s. a year to a farmer, and that of man ought to be far more valuable. They must all admit that unless fertilising properties were put back on to the land it would cease to produce anything at all. Of course they had a great importation of guano, and throughout the whole of Europe everybody was struggling to get the stuff into the land somehow. The sheep was a very valuable creature for this purpose, and was very ready to put the manure where it was wanted; but a man, who ought to be the most profitable of animals for the land, was only worth in Lancashire and Yorkshire about 5d. a year, and it was very difficult even to get that. The agricultural worthlessness of the enormous stock of man in the Mersey valley, as folded on the land, was a perfect scandal. Rochdale was an instance where they were trying to utilise it and be clean, and he hoped they were going to succeed. As regards their being clean, he must say something in answer to what had been said from his own experience. He had been to Rochdale once or twice, and had visited some of the dirtiest quarters of the town, inhabited chiefly by Irish. He examined the closets there, there being one between every two houses, and he found them very much sweeter than some water-closets, and an immense deal sweeter than a privy in a garden. An old woman came out; and a friend who accompanied him, remarked to her, how sweet and clean the place was, when she said "Clane! your honour! we have all become clane since we got rid o' those bastely English." The Chinese, although they were very dirty, and did not manage the work very well, had for hundreds of years known how to deal with this question. He had a quotation from Hakluyt, who wrote a book on the principal navigations and discoveries of the English nation in the year 1589, and in his second volume, speaking of China, he described a class of persons who went about in every street buying "this dirty ware," and said "The custom is very good for keeping the city

clean." He entirely differed with Dr. Fox in thinking that water-closets were the right thing. Water was the most profligate associate of excreta. The excrement and urine were valuable, and the problem to be solved was how to turn them into the land with the greatest profit. He had been looking closely into this question for some years, and he ventured to say that in eight months from this time they would find another large town—Blackburn—which was adopting means to prove that they could deal with this excrement as quickly as possible without nuisance. According to Dr. Voelcker, Blackburn would produce a manure containing about half as much as Peruvian guano.

Mr. Spencer said he would ask gentlemen to use their common sense. Could they suppose it possible that the Maker of All had made any animal so that its own excrement should be poisonous? The fact was, the excrement of no animal was poisonous, but when it came in contact with water, decomposition took place, and it was unwholesome. From fresh excreta there was a certain amount of sulphuretted hydrogen given off, which was unpleasant; but when they went to Harrogate to drink the water, they smelt 50 times as much sulphuretted hydrogen, and considered it wholesome.

Mr. Chesshire then stated the substance of his paper, and said his object was not to advocate his own particular plan, nor any other, but to advocate the principle of interception. He also wished particularly to say that the term "sewage," as applied to excreta, was a misnomer, and tended very materially to mystify the whole discussion. Human beings did not void sewage. The sewage was the contents of the sewer, of whatever material those contents might be composed, and the excreta of the population was quite different from sewage; in fact it would be as correct to speak of the sewage from heaven as to speak of the sewage of individuals, for a much larger proportion of the contents of town sewers consisted of rain water than of what came from the inhabitants.

The Chairman asked if Mr. Chesshire's plan had been adopted anywhere?

Mr. Chesshire said it had been in numbers of instances, in India, Norway, and in several places in England.

The Chairman said no doubt Mr. Chesshire was quite right scientifically, but he feared it was like other panaceas, not practical.

Mr. Chesshire said his plan was most practical, though it had not been used as a system anywhere, but only in isolated cases.

Mr. Chadwick asked what was the cost?

Mr. Chesshire replied, probably about 2 guineas, or it might be 3.

Mr. Williams said the urine was the most valuable part of excreta, and he understood that was thrown away.

Mr. Chesshire said no, it was treated at the outfall.

Mr. Edwin Chadwick, C.B., said—It is due to the Congress to state my views on the relative sanitary and economical merits of the principles of water-carriage, as compared with the pail system of the removal of the excreta, as brought forward by the representatives from Rochdale. The primary condition to be dealt with on sanitary principles is this, that the removal of all fæcal matter from within or beneath houses, or the sites of towns, shall be effected before putrefactive decomposition commences. We ascertained that, in ordinary weather, commencement of the putrefaction of such matter in solution in water is within about four days. In some conditions it is immediate, and in some weathers it is within the day. Prolonged exposure to the emanations of putrefaction, even in ordinary weather, tells upon the strong, and eventually it leaves its mark upon the death-rates, but short exposure particularly affects the diseased, the weakly, and the susceptible, especially in epidemic periods. During epidemic periods we gave orders at the General Board of Health for the removal daily of all putrescible matter from within or without urban dwellings. Now, how long would a physician or a careful nurse allow such matter to be kept in a pail and undiluted, in a sick chamber or within the premises? In the lower district of badly administered towns, in this respect, such as Manchester and Birmingham, excreta were allowed to remain in cess-pits and middensteads, in heaps in state of putrifactive decomposition for a year. It is, doubtless, an important mitigation of such insanitary conditions to reduce the period of the exposition of putrescent matter, and to remove it within a week; but that is more than three days too late, even in ordinary weathers. It is three days of developed putrefaction and of the noxious gases. Now, is there any officer of health here who understands his duties, who can be unaware that the thousands of such sources of pollution of the atmosphere in Manchester proper, upwards of a hundred thousand, or of Birmingham, will not sensibly affect the sickness and death-rates of an urban population. But the representatives of Rochdale say that a reduction of the death-rate has followed the introduction of the pail system, and they present it boastfully as a final accomplishment. From what I have stated, it would follow that their removal should effect some reduction of the death-rate, it being clearly a reduction of the evil. But the removal by water-carriage is not in the week or in the day, or even in the hour, but in the minute, and in connection with properly constructed channels, it is a complete removal, followed, and it is followed with certainty, by a more full reduction of the death-rate. The representatives from Rochdale have congratulated themselves upon what they consider to be a high state of health, as denoted by what they consider a low death-rate of 20 in the thousand. But they have yet to learn what good attainable standards of health are. I give them an approach to one. Dover had, when first dealt with by the first General Board of Health, about the same death-rate or a little higher, and has now what Rochdale might have now under competent sanitary rule, a death-rate of fourteen per thousand. The difference between well water-closeted urban districts and "tubbed" or middenstead districts, is generally a difference of one-third in the death-rate. On observation I venture to assert, that the present defective sanitary rule at Rochdale involves a loss of at least eighty lives annually of that very good population, besides more than twenty times that number of preventible cases of sickness, involving extensive premature working disability. On the other side, however, we have heard here carriage by water denounced as a means of the distribution of poisonous gases through houses and towns. It is to be made known to those who give such descriptions, that what they call carriage by water is, through want of competent administration and of skill, to be correctly called "mis-carriage by water." Under the insanitary administration and ignorance of systematic works, not only by common builders, but by architects, and even by insanitary engineers, as we have shown even here under the government of the metropolis, the works for water-carriage are extensively so misconstructed as to miscarry, and to detain, in conditions of putrefaction, what ought to be removed, under which conditions they are no better than the pail system. The common flap traps of the water-closet are frequently so constructed as to throw aside and keep much of the fæcal matter under the seat. The common channels for water-carriage, the house drains, are frequently constructed of permeable brick, or of large tubular pot drains, so constructed, and so laid, as to

obstruct the flow, to occasion deposit, or to let the liquefied excrementary matter out at the sides, or at the joints, and create excrement-sodden subsoils. And next, the sewers into which the surplus contents of the house drains discharged are so constructed, of such large sizes, and forms, and inclinations, as to obstruct the flow, and to detain matter in conditions of noxious decomposition, and generate foul gases, which are discharged into the streets and houses, until the matter is flushed out artificially, or by extraordinary storms at long intervals, when that removal takes place, which, with proper constructions for water carriage, should be instant and constant. Such are the conditions of ignorant, unskilful water miscarriage, misdirection, and consequent stagnation, almost general with the house drainage of the metropolis, and to the extent of a thousand miles of sewage of deposit. And such conditions of expensive and unskilful miscarriage are called "water carriage;" and I, who have directed trial works and elaborated complete instructions for preventing these noxious conditions have been here denounced for creating them! Ill-constructed, in the defiance of sanitary science, the water-closet is a source of disease; well constructed, it is a great means of prevention. Of this I can give conclusive proofs. Here is one. The well-kept prison is, as I have shown elsewhere, the highest norma of health in the country; the general death-rate amongst those not brought there in a state of disease, being not more than three in a thousand. In every cell of the model prisons there has been a soil-pan. I do not regard it as a source of health; it is simply a channel for the immediate removal of the putrescent matter which is the cause of disease. This arrangement is now, I understand, being altered in prisons, not on account of any sanitary objection, but because it was found that the prisoners used the soil-pan as a sort of speaking trumpet to communicate with the other prisoners. Now, as to the relative expense of the two systems, the dry carriage and the water carriage. We have heard it stated, that the cost at Rochdale of the weekly removal by the tub is £1 per house per annum. This is about four times more than the system of immediate removal by water carriage, in connection with the necessary removal of the kitchen and laundry slops by the house drains which must be provided for that liquefied manure. The augmentation of the expense by a half-weekly or a daily removal of the putrescent matter and the augmented annoyance of the process, is a barrier to the improvement of the tub system by a more frequent, or a daily removal requisite to make it safer. Human fæces are treated as if they constituted the great bulk of the putrescible, manurial matter to be removed from a house, whereas they constitute a very minor part of it. The Rivers Pollution Commissioners found that between a water-closeted and a non-water-closeted town, the difference in the manurial matter at the outfall of the sewers was about one-fifth. The cost of the weekly removal by the tub of that one-fifth will everywhere be found to be much greater than the cost of the most complete system of instant removal by self-cleansing sewers in which there is no stagnation and from whence there is no smell. Wherever there is the escape of smell there is bad engineering, bad work, bad supervision, wasteful and bad administration. The construction of large sewers, to receive extraordinary quantities of storm-water, occasioning deposit during the ordinary flow, and also deteriorating the sewage as manure for the farmer by excessive and irregular dilution, is all a forewarned big blunder by the local authorities. Effort is now being given to the protection of houses, by trapping, against the admission of sewer gases; that should be given by correct construction of the drains and sewers, against the generation of those gases from stagnation. One argument in support of the dry system of carriage, as at Rochdale, as to its conservancy as manure (which is at the expense of the health of the population by its detention amidst houses), is erroneous, as the system is wasteful of manure, which is best conserved by its immediate reception in water, and by its immediate removal to the land. In water-closeted towns, such as Croydon, Leamington, and Bedford, the whole of the manure from the houses is on the land in two or three hours; and, on the same system of water-carriage, the whole of the manure of the metropolis might be on the land, not in mechanical suspension, but in chemical combination, within the day. The dry system for agriculture is wasteful of labour and manure, and in contravention of the maxim laid down by the greatest vegetable physiologist of the last century, De Candolle, that the future of agriculture will be in giving water and food to the plant, manure, at the same time. Plants do not feed on dry manure, for which they have no mouths, but assimilate liquefied manure or gaseous moisture. The processes for solidifying manure are generally processes for taking manure out of water to be put in water again for assimilation, as by the liquid manure drills. The argument in support of dry-carriage, that land is not to be had for water-carriage, will be required to be met by better legislation, which will reduce unearned monopoly value of quadruple and quinquennial rentals. A right of expropriation, at double the average rental of the land, with which landowners should be content, would generally suffice for the relief of urban populations, and should in that respect be contended for. No material inconvenience is found at sewage farms in dealing with the sludge or solid deposit, removed by water-carriage. It usually occupies a small per-centage, three or four, of the land in which it is worked in like the solid manures in market-garden culture, but that manipulation is expensive; and I consider that that portion of water-carried matter admits in some cases, where there is a large amount of it, of such improvement as General Scott has made. Nature abhors stagnation, whether dry or wet, and punishes people for it. The arterial and venous system of constant circulation is, however, with the progress of science, making way against it.

The Chairman next called upon Mr. Pollard, of Halifax.

Mr. J. Pollard (Halifax) said, in making a few remarks on the Goux system, as adopted at Halifax, I think I may do so briefly by comparing the cost, as given by me at the Conference last May, for the year 1876, with the year 1877. The total cost of cleansing 3,400 closet tubs and ashes tubs, in 1876, amounted to £3,666 2s. 2d., and the receipts for manure sold, £500, leaving a nett cost of £3,166 2s. 2d., being at the rate of 18s. 7d. per closet per annum; whilst, during 1877, we had 3,800 closets, being an increase of 400 over 1876, and the cost of collection amounted to £3,678 14s. 6d., and the receipts for manure sold, £516 13s. 6d., and an average cost of 16s. 8d. per closet; thus showing, as I stated last year, that the same staff of men and horses could clear more closets at a less cost, as the area is no greater for 3,800 than it was for 3,400. At present the cost of working the Goux department is paid as follows:—The owner or occupier pays 5s. per closet per annum, and the remainder is paid out of the rates; and, I think, next year the sanitary committee will recommend that the whole cost of cleansing both Goux closets, and old privies, and ash-pits, should be paid out of rates, as it will then save the cost of collecting the charges for Goux closets and ash-pits. As a deodoriser for the tubs lining and manure, we still use charcoal and soot, which gradually but constantly deodorises the contents as the tub becomes filled. We frequently have to compare charcoal with newly invented deodorisers, and as yet we have found nothing which, in our opinion, surpasses it. The value of charcoal may

be easily tested by putting a handful into a tub of excreta, and in a few minutes the smell is almost entirely gone. We are now making two qualities of manure; one is made by mixing screened ashes, street sweepings, shoddy (costing 7s. per ton), soot, and excreta, which is sold at 2s. 6d. per ton; and a better quality of manure is made by mixing together shoddy, charcoal, and excreta, which sells at 8s. per ton; one ton of this shoddy takes up about four or five tons of excreta to make it portable, and after being deposited a few days in our sheds for the liquid matter to drain off, it is carted away by neighbouring farmers, or sent away by canal into farming districts; a little over 25 per cent. of the tub contents brought into the depôt is drained off into a large covered tank, and is sold at 1s. per barrel. The shoddy used for this manure costs 20s. per ton. Part of it consists, I believe, of ground rags with the cotton fibre burnt out of it with sulphuric acid; but it is chiefly woollen dust, and is mostly sent into Kent and other districts for growing hops. So far, we have had a good demand for both kinds of manure; in fact, we have not been able to supply the demand. Respecting the question as to the emptying of ash-pits under the old privy system at Halifax, I may say that it has been as follows:—

1	ash-pit was emptied	5	times
8	,,	4	,,
34	,,	3	,,
162	,,	2	,,
970	,,	once.	

So that five-sixths are emptied only once a year. The cost paid to a contractor for emptying ash-pits is 14s. each ash-pit, so that the cost of clearing the Goux closet once every eight to ten days is only 2s. 8d. more per closet than the old privy, which is emptied once, and in some cases two or three times a year, but if the old ash-pit was to be emptied more than once a year then the Goux system is considerably cheaper, and looking at the old method in a sanitary point, where the contents, all kinds of vegetable and animal matter, putrify in the sun, or percolate under our dwellings, endangering the lives of thousands in our large towns. I saw the other day a large ash-pit with 10 privies emptying into it, and it was situate between and adjoining 20 cottages. There was a bedroom over, and the ash-pit was on a level with the cottage cellars, and there is no doubt that a portion of the contents percolate under the houses, and perhaps the very foundations are saturated with liquid matter from those privies. The death-rate before we had the Goux system was in 1870, 29·0; and in 1871, 31·5; whilst in 1876 it was 23·5; and 1877, 25·8 per 1,000; and what will, perhaps, be more striking, is the rate of mortality during last year in Halifax from zymotic diseases where the Goux closets existed as compared with water-closets and privies.

Number of Goux closets	3,800	.....	Deaths 29
,, water-closets	2,659	.....	,, 36
,, old privies..	3,063	.....	,, 41

So that it will be observed that the death-rate is very seriously in excess where water-closets and privies are in use; but I think I must leave the figures to speak for themselves. It may be observed that there is only an increase of 400 to the Goux system during 1877, but that no doubt arises from the depression in the building trade, together with the small owners of cottage property not being in a position to alter them, and not from any fear of the system being a success, as it is a rare occurrence where we have complaints; and I believe the Goux system is the greatest boon that was ever given to the poor and overcrowded districts in Halifax. The following table shows the analysis of the dust manure or "shoddy," as tested by Agricultural and Horticultural Associations' analyst, January, 1878:—

Moisture	10·54
Organic matter	65·06*
Phosphates	1·76
Alumina, carbonate of ammonia, phosphate, &c.	5·24
Insoluble matter	17·40
	100·00

Mr. Green asked if the urine and liquid slops did not still go to pollute the river?

Mr. Pollard said the urine was taken away with the closet tub, and drained off into a tank, and was sold in barrels to farmers. The whole of the slops went into the sewers, and was discharged into settling and filtering tanks.

Mr. Robert McNicoll, medical officer of health for St. Helen's, said that if towns which had not yet introduced any new system required any justification for their delay, it would be found in the contradictory opinions expressed by different gentlemen on that and other occasions. It was very good, no doubt, on the part of Rochdale and other towns to go to the serious expense of trying experiments, and it would not do for everyone to wait for other people; but those who had waited must not be understood to be doing so entirely from apathy, but because they wanted to know in what direction they ought to travel. When parties were somewhat agreed as to what was the best and the second best mode of dealing with this question, they should be ready to adopt it. He quite agreed that they must be first pure, and then economical, and, therefore, the commercial element should not be paid too much attention to. In St. Helen's they had carried out the old midden system, and tried to do it efficiently and quickly, and although the death-rate for special reasons, it being a chemical town, was still high, it was only 21 last year, 22 the year before, and 23 the year previously. This was not very bad for a town polluted with noxious vapours.

Mr. S. Alcock (Sunderland) said in his town they were, probably, better situated for carrying out the water-carriage system than almost any other town in the kingdom. They had found, as he fancied all large towns would find, that it was impossible to take one system and carry it out throughout without reference to circumstances. Supposing they were of opinion, which they were not altogether, that the water-closet was the best system, how were they to enforce it? The Act did not empower any local authority to say that a person should remove an efficient privy and provide water-closet accommodation; and if a man had an efficient privy it gave them no power to get rid of it. They might agree that it would be desirable to get rid not only of cesspools, but also of privies and ash-pits, but they found they were in a difficulty in doing it, and had no power to enforce such a measure. Therefore, they were obliged to turn their attention in Sunderland to the adoption of some system besides the water-closets. They visited various places, Rochdale amongst others, and were very much indebted to Rochdale for commencing a system of that kind, and showing how the thing could be done very satisfactorily indeed. They had come to the conclusion that the pail or tub system was most desirable in connection also, where it could be done, with the water-closet. In some of the more crowded parts of Sunderland the adoption of water-closets had been enforced, but they had been obliged to remove them, for in many places where large numbers of people occupied the same house, they did not seem to have the slightest respect for sanitary laws, and the water-closet did not act satisfactorily. Mr. Chadwick had spoken of removal once a week, but that was not a necessary part of the tub

* Containing nitrogen 3·07, equal to ammonia 3·73.

system. It might be removed daily, if necessary, and in all large towns they were obliged to have, more or less, a system of daily removal of some kind, to get rid of the rubbish, and that could not be avoided by the most perfect system of water-closets. Another great advantage was that you could isolate cases of infectious disease. Again, when the excrement was thrown into the sewers, it was to a considerable extent wasted, and when it ran into the sea, entirely so.

Mr. Chadwick asked if they had no land near Sunderland available for irrigation?

Mr. S. Alcock said it was enough to frighten any town which thought of adopting a system of utilisation of sewage, to go to Birmingham and Manchester, and see the immense expenditure necessary for a sewage farm.

Mr. Turner (Portsmouth) said in discussing this question of the tubs over water-closets, it seemed to be held that it was a mistake to put the excrement into water, and that, if mixed with ashes, decomposition was to a great extent prevented. In all the towns in which the pail system was being carried out, ashes, as a rule, had not been used, and the excrement had been allowed to remain in pails for a longer or shorter time. It was claimed that by this method you had a means of isolating cases of infection, although there seemed to be no treatment of the liquid portion, which was just as dangerous to public health as diseased excrement. Then, again, he would remark that healthy people must use the same closet, for a certain time, until the disease was discovered, and they would be exposed to direct infection. Again, it was said that decomposition did not set in early, but in cases of disease it had very often commenced already in the bowels. Any person who had examined freshly-passed fæces, knew that in a healthy individual there was very little sign of decomposition; but directly the bowels became disordered you had all sorts of organisms springing up and showing themselves immediately the excrement was passed. With reference to sewage gas, and the fact of wealthy people being affected rather than poor persons, he was aware that it had been observed on several occasions, but it was not because people had water-closets that they had disease, but because they wilfully misconstructed those places. Out of 100 closets in London very likely 99 were not properly constructed. You must not suppose that all the evils of a bad system were necessarily connected with water-closets. You might have a water-closet so good and so properly arranged that you could not by any possible means derive any ill effect from it. Still he thought Mr. Chadwick had made an unfair use of prison statistics in quoting the death-rate at 3 per 1,000, because one must recollect the ages of the people you had there; they were all at the healthiest periods of life; there were no children; the inhabitants were forcibly placed under good conditions; not allowed more food than was absolutely necessary to keep them alive; and, in all these things combined you could hardly help having a healthy set of men.

Dr. Yeld (of Sunderland) said he should like to supplement the remarks of the Deputy Town Clerk of Sunderland, especially in reference to what had been said by the Chairman as to the disposal of the excrement of large towns. Mr. Chadwick seemed to have the water-closet theory a good deal on his mind, and to forget altogether the great agricultural districts of England, over large districts of which it was impossible the water-carriage method could be applied. In large towns the greatest difficulty was the disposal of refuse when it was collected, and that arose not from want of purchasers, but from want of facility to get it conveyed to the agricultural districts. In their own town last year there were something like 30,000 tons of refuse, of which 23,000 went on to the land in the neighbourhood, and there was no one but would admit it was far better that it should do so than go into sewers and out to sea. It must also be remembered that although sewage carried on to land would do an immense amount of good, there was certain land which it would not percolate, and where, if applied, it would be utterly useless, whereas if the excreta, mixed with ashes, were put on the land, there were hundreds and thousands of acres of heavy clay-land which would be immensely improved.

Mr. Hawkins (Wallingford) said it seemed to him that they should have two systems, and he wished to ask whether by the pail system the liquid slops were mixed with the excreta?

The Chairman said no, the introduction of slops into the pails was prohibited.

Mr. Hawkins said whenever the dry-earth or pail system was adopted, it seemed to be understood that there must be a separate system of house slops, and then came the question whether it was worth while having the expense of two systems.

The Chairman said there must be a system of drainage in any case, for carrying off the surface water.

Mr. Kerr (Halifax) had had personal experience of the pail system, and as far as his observation went, it was the best. He believed the Goux was the best system of collection, though they had given away the manure. If they could adopt the system in operation in Birmingham, namely, that of General Scott, he thought that would be the best for making the most of it.

Mr. Leech said he represented a district near Manchester, and they found that closets were often a great nuisance. If rich people could not keep them in order, as often happened, he did not know how the poor were to do it, He knew a district where they had just laid down a system of drainage, and spent some thousands of pounds, but it did not prevent an intolerable smell coming up directly the river rose at all; and there was no question that they would have to do something to prevent it. They had been looking at the pail system, and liked it very well, but found a difficulty in carrying it out, because the pails became offensive. People would not pour ashes into the pails, or take proper care. He happened lately to go into Cumberland, where they were in a very primitive state, and had no such things as closets, but had a tub filled with ashes with a board over it. A friend of his seeing this plan thought he could improve upon it, and had invented a kind of handle with a rotary motion, so that every time the closet was used it spread the ashes over it; and, he believed, if something of that kind could be made it would be the best thing for many districts.

The Congress then adjourned for luncheon.

On resuming, **Mr. Stansfeld** again took the chair, and said he hoped they would endeavour to get through the remaining five heads of discussion, so as to leave only the seventh for the following day.

Mr. George Hurst then stated the effect of his paper.

Mr. Chadwick asked what was the number of houses in Bedford?

Mr. Hurst said the population was about 19,000, and the houses were water-closeted. They heard of no complaints of anything offensive in any way whatever. In every town there would be filthy people who would not keep their own persons nor anything about them clean, but, taking it as a whole, nothing offensive had ever occurred.

Mr. Haresceugh asked what was done with the vegetable refuse and ashes?

Mr. Hurst said they were carted away for gardens and farms. Those matters were not offensive to health.

Mr. Cheshire asked what was the condition of the house drains?

Mr. Hurst said his own drains had nothing offensive about them, and he had heard of no complaints.

Mr. Haresceugh asked if the farmers bought the ashes and refuse for the purpose of manuring their farms, or if they were fond of having cinders to manure with?

Mr. Hurst said there were people who made a trade of collecting dust and ashes and carting it away.

Mr. C. N. Cresswell said his paper had a double aspect, but he would confine his remarks at present to the second head of the discussion, namely, what progress, if any, had been made in treating water-carried sewage during last year? He considered the most important words in that query were the words "if any." He much regretted that the magnificent map which hung on the wall during the discussion on water supply had been removed, for it would have been the most eloquent advocate he could desire of the proposition he put forward, which was that they had made no progress whatever. That map purported to be a cartoon of the polluted rivers of England, each river being marked by a deep blue line, and each watershed was marked so as to show the source of pollution, its character, and extent. If the Rivers Pollution Commission had never done anything else to earn the gratitude of the country, the production of that map was enough. the words "Polluted Rivers" must have been put on it in irony, because every river was polluted, from the Tay, in Scotland, down to the Dart. It was accompanied by another map, which showed the extent of pollution by a deep blue mark, and there were only five small white spots over the face of the whole country, one at the extreme end of Cornwall, another in Wales, another at the extreme end of Kent, and again at the north of Scotland. From that they might form some notion of the amount of pollution going on, which rendered it impossible that this meeting could say, with any consciousness of truth, that they had made any progress whatever in dealing with water-carried sewage. They were in this position, that at the present moment they had not so much power of dealing with the accumulated sewage as they had 20 years ago. And why? That want of progress was due to two causes, to which he would call attention. The first, and probably the most important of the two, was the same which had hindered progress in another place, of which they had heard so much lately—the existence of obstructives. There were local obstructives, as all medical officers knew, and imperial obstructives. The local obstructives were now what they always had been, and always would be to the end of the chapter, that stolid, stupid, inert element of our population and every other population, with which every scientific man and philanthropist had to deal. They were the same to-day and to-morrow, and you could only overcome this by the remedy to which the Chairman had so ably alluded in the morning, the education of the people in the ways of truth and cleanliness, and a just appreciation of the health they ought to enjoy, and which Providence intended them to enjoy. He should refer to-morrow more particularly to imperial obstructives, and would only hint at them now. This obstruction arose from a bigoted adhesion on the part of our guides in the central department to the ancient ways and notions which prevailed five, ten, or fifteen years ago, without regard to the advance of science, or the conclusions of bodies such as that Conference during the last few years—a steady adhesion to a Procrustean policy, the same policy which the robber Procrustes adopted, when he said that every man ought to be of the same length, and if he were not of the proper length he would either cut him shorter or stretch him on the rack; by exacting ransom on that principle he robbed nearly everyone. That was the policy of the Central Department There was no possibility of extracting from that illustrious body any information to guide the public. Now, the second cause, and the most patent cause of the want of progress had been the accumulation of polluted water as the result of the inordinate, reckless, and extravagant use of water-closets. It was useless to tell him that a water-closet was a valuable implement, and would carry away what you wanted to remove as quickly as possible. Whither was it to go? You did not carry it away; you simply transferred it to your neighbours; in legal language, you changed the venue, but did not abate the mischief. Was it any satisfaction to a Conference like that to say, as many of our towns might say, "Thank God, we have got rid of our sewage," in the same way as London had, by sending it down to Gravesend? That was the system by which the volume of pollution was increased enormously. He was within the mark in stating that, for every gallon of human excreta you carried away by the so-called water-carriage system, you utterly polluted and rendered useless for humanity, certainly for your neighbours on the river below, some 200 gallons of pure water. Consequently, in order to carry away 1,000 gallons of fæces in any one day from a town, it was necessary to pump 200,000 gallons of pure water into that town, to be the vehicle of carrying it away. And what was the consequence? During the progress of what was called sanitary science of eight or ten years, the number of water-closets had increased five-fold, not only in towns but in rural districts, where, in fact, they had no means of getting rid of the sewage so manufactured. He concluded, therefore, that there was no progress whatever, and in his paper he had thrown out a challenge which he should be glad to have accepted; simply this, if even one of our rivers had been rescued during the present year from abomination, it would be an answer to the query set forth in the programme, and they should not be without encouragement for the future. All he could say was, that if anyone present could stand up and tell him of one single river in this fair country rescued from contamination, he should congratulate him, and be only too happy to stand corrected. He would conclude with a short story. He happened to reside in a beautiful part of England, where there were many hamlets scattered about—a large urban sanitary district. One of those hamlets, within a few miles from London, was situated on a very fine gravel bed, at an elevation of about 100 ft. above the level of the Thames, with all the advantages of a healthy soil. Twenty-five years ago, there was no disease whatever in the place of a zymotic type. Unfortunately for the district, a lady of rank came to live in it, and took a house, and she, of course, must have a water-closet. She introduced a water-closet into that unfortunate village. People, of course, imitated in every way what was done by persons of rank, and, consequently, everybody else had a water-closet. There were at one time about 15 cesspools in the gardens, which had been constructed for domestic slops and house-water, and of a certain capacity. They were found to be of no use whatever for water-closets, and they overflowed directly, and saturated the gardens. The medical officer was immediately called in, and he believed the lady of rank herself was the first to raise the outcry. In the middle of that little hamlet there was a pretty green triangular piece of ground, and without saying a word to any authority, for they had none in those days, in the middle of the night they dug an immense hole in the centre of that beautiful ground, covered it up again, and made it what they called a common cesspool for all the well-to-do houses, which opened connections for their cesspools into it. They thought, now we have got rid of our difficulty, we have a common reservoir into which we can pour our common filth. But, unfortunately, the enormous increase in geometric progression of the volume of pollution found them out, and in less than eighteen months that large cesspool

overflowed to such an extent, that it filled and poisoned the water-courses within half a mile, and at length found its way into a beautiful pool, where it destroyed every living thing, and produced such a mass of pollution, that the last act he had to perform as Chairman of the Sanitary Committee of that district, was to compel the owner of the pool, at his own expense, to clear out the accumulated filth of the last twenty years. That was the difficulty they had to deal with, and unless some adequate means of dealing with it were discovered, it was impossible to say that any progress had been made.

Sir Henry Cole said he might reply to **Mr. Cresswell's** challenge. He would not make a speech, but would simply show what had been done at Burnley. On the table was a bottle of the sewage of Burnley, which he showed. The town had been under an injunction not to pour into the Pendle River. Accordingly, Burnley made some tanks, called in General Scott's process, and produced the clear, effluent water which he showed in another bottle. It did that by putting in the lime, which was also shown, and out of the sediment it produced a cement, which was also shown, worth 40s. a ton. With regard to the cost, his proposition was that people must pay to be clean; you could not wash your hands without soap, and somebody must pay for it, but he believed the whole cost of these works was about a rate of 3d. on the rateable value of the town.

Mr Hurst said he would also reply to the challenge. The beautiful river which ran through the centre of the town of Bedford, previous to the adoption of the present system of irrigation, was very much polluted, but now you could go there in fine weather, and the water was as clear and pure as if it came from the clouds. That was without General Scott's process.

Sir Henry Cole said Bedford had plenty of cheap land, which Burnley had not. He had omitted one fact, that was, taking the average cost of irrigation schemes throughout England, it was about 7d. in the £ on the rateable value.

Mr. Green wished to ask whether that effluent water from Burnley, within any time, and what space of time, set up an after decomposition?

Sir Henry Cole said they had heard nothing about it. The injunction was withdrawn, and the town was perfectly satisfied.

Mr. Cresswell asked what was the river upon which Burnley was situated.

Sir Henry Cole said the Pendle water was nearest Burnley, which ran into the Calder, and that into the Ribble.

Mr. Cresswell said there was great difficulty arising with regard to the Ribble at the present time.

Mr. Andrews asked if they had the water carriage system in Burnley, or the pail system?

Sir Henry Cole replied, the water carriage system and cesspool system.

Mr. Chadwick asked Mr. Cresswell, whether in respect of river pollution, he had made any estimate for the increasing surface there was of cultivated lands which discharged manures into the river?

Mr. Cresswell said there could be no doubt that one of the most important elements of pollution was the washing of imperfectly assimilated manures into the river in times of flood, but that only applied to places like the Thames Valley. It could not possibly apply to his illustration, namely, the enormous accumulated volume of sewage which had to be dealt with, in consequence of the use of water-closets in small country villages away from any river.

Dr. Syson thought Mr. Cresswell took rather too gloomy a view. During the past year a great deal had been done to prevent the pollution of rivers, as, for instance, at Birmingham, Manchester, and Salford. If they had not actually done it, they were doing it, and he was sorry he had mixed up a crusade against water-closets with his otherwise valuable paper. In these matters they ought to be eclectics, and take one thing to one place or two if necessary, and another for another. In large towns they had a great deal to congratulate themselves upon in the way of progress; where they could not do so was in rural districts, and the reasons were easy to find. Before any great national progress could be made, you must discover some ready means of enabling them to acquire land, and the necessaries for carrying out purification; nor must they look for too fine a Utopia in the rivers, for absolute perfection was impossible, even if it were desirable, for they could never stop imperfectly assimilated manures going in. If they could give corporate bodies and small local Boards a more ready way to acquire land at a reasonable cost, instead of the ruinous prices they had now to pay, they would make still more progress; but they had made a great deal, and he thought the challenge could be fairly answered. Mr. Cresswell also seemed to forget the slop difficulty, which none of the dry closet men seemed to trouble themselves much about, but he thought it might be made the means of carrying the sewage. He had no doubt himself that water-carriage, where you had a large number of houses together, was the cheapest way, unless they might, so to speak, put the sewers on wheels and carry it in that way.

Mr. Cresswell said he had in his paper suggested the very remedy to which the last speaker had alluded.

Captain Stott said Dr. Syson had alluded to Manchester having done a great deal to remove the nuisance in the rivers, but he should like to know what they had done?

Dr. Syson said Manchester and Salford were so close together, that he would take them as one; Salford had done a great deal and Manchester was doing it.

Mr. Cheshire said one gentlemen had unfortunately referred to Birmingham as a town where great improvement had been made recently. It happened that he had rooms in Birmingham, and lived on the banks of the Tame, into which the sewage all passed 25 years ago, including all the manufacturing refuse, and the sewage from all the houses. At that time it was of crystal purity and one of the finest fishing rivers in England, what had been done since? Gentlemen, like Mr. Chadwick and Mr. Rawlinson, had come forward, and insisted on Birmingham turning 15,000 water-closets into this same river, and with what result? He had three-fourths of a-mile of fishing in that river, and he pledged his word, except a few eels, there was not a fish in it. Seven years ago, if his dog went into the water it came out sweet and wholesome, but if he went in now he was so offensive that he could not bear him near to him. He held in his hand a report of the Sewage Committee of Birmingham, and throughout the whole of that report it was stated that the excreta must kept out of the sewers, yet it was not kept out; it still went in, and in an intensified degree. He had had the honour of an interview with the Local Government Board on that question, with his right honourable friend Lord Norton. He told Mr. Rawlinson then what an amount of evil was caused by the excreta being put into the house drains, that the evil really was not in the sewers, but in the drains. These gentlemen would overlook the house drains altogether, in their anxiety for sewers and sewage farms. He was a member of the medical profession, and he knew that typhoid fever, diarrhœa, dysentery, and diphtheria, and all diseases which affected the alimentary canal, were propagated mainly through the medium of the bowel secretion, and in no other way to any extent. He explained this to Mr. Rawlinson, and after giving his explanation, that gentleman began to laugh, and said

that he, Mr. Cheshire, was like the Mayor of Windsor, who would have had him hanged. He said he would go beyond that, for, if he had had his way, he would have had him hanged 20 years ago, before he had done the mischief. He declared there were two men who had destroyed, by putting excreta into the sewers, more human beings than any other two men who ever lived, and these two men were Mr. Chadwick and Mr. Rawlinson.

Mr. Chadwick said there had been an attempt to get possession of land, which would have avoided all this difficulty, but it was arrested by the landed proprietors, who wanted 150 years' purchase for their property. It was to the House of Commons it was due, all this pollution being thrown into the river, which ought to have gone to the land.

Mr. Cheshire said if a thousand acres had been procured, what effect would that have had on the condition of the Birmingham drains within the borough? That was where the real evil lay.

Mr. Lawrence Hamilton said, a Chinese author, writing 11 centuries before the Christian era, said—"The disposal of stinking fish is a very difficult and a serious matter." So was it with the drainage. When he heard a gentleman say that one system was good, he was surprised, for he considered all systems were bad and faulty, though some were a little worse than others. It must be remembered that in sewage you had four distinct things to deal with; first, the sewage that came from the heavens, rain, and analysis of that rain mixed with filth from streets and houses was as offensive as that which came from the excreta of man. You had next the slops, which were very offensive and dangerous. Then there were the excreta, the solid matter, fæces, and urine. The most difficult thing was the fourth, namely, the insoluble solids, consisting of cinders, vegetables, and so forth. Although he was familiar with most of the systems for disposing of the solid insoluble excreta from houses, he must confess it was a problem still unsolved to say how any solution of the difficulty could be arrived at. In an isolated house, situated within its own grounds, the dry system was possibly the best; but when you came to deal with a street or with towns you must fall back on the water system. They had heard a great deal about the cost of applying sewage water to the farm, and no doubt one of these days they would hear from some of those who were enthusiastic advocates of the dry system, that the only way to dispose of the excreta and urine of men and women would be to have express trains to take them down, at defecating hours, to sewage farms, so that they could there apply, without any trouble, the excreta directly to the farm. He did not wish to joke before so distinguished a body, but he had purposely reduced the system to the ridiculous, in order to show that no one method would be perfect. He put cost quite on one side, for he cared not what one system, or two, or three might cost; he would have that system mixed or pure, as the case might require, regarding more the result on the health than on the pocket. Lastly, the great mistake which sanitarians had made was this, they rather set themselves to consider the perfection of a theory, instead of looking at the faults of the practical system as it now existed. For his own part, he felt that men like Mr. Chadwick and Mr. Rawlinson might well be trusted to advise on this subject from their huge experience. The fault did not lie in the sewage; it lay first in the water-closet, and then in the leaden pipes, which, if unventilated, would only live 12 to 20 years, without being subject to a series of pimples which soon become ulcers, and shortly afterwards perforations, through which the sewer gas escaped into the house and produced weakness, sickness, and ultimately premature death. Science showed that if the pipes were ventilated they would last twice as long; and he asked those who had more mechanical knowledge than himself, to try to devise some material which should not be so easily perforated and riddled.

Mr. Chadwick suggested glazed earthenware.

Mr. Hamilton said that was very good in theory, but they could not be introduced into the house, where they had to be laid perpendicularly. They did very well in a horizontal position, or in a slight declivity, but if placed upright they were apt to get out of line, and the joints became faulty. In almost every house in London connection from the house drain to the public sewer was at fault, and the whole of this should be under Government authority, without which they could never get rid of scamping and slovenly workmanship.

Dr. Wright said one would think, from the observations they had heard to-day, that no progress had been made, and that it was impossible to sewer a town or make any real progress in sanitary matters. Now, in Cheltenham, he thought they had accomplished the matter very well, and it might be done elsewhere, provided the towns were so situate as to enable an engineer to do it, and that people would put their shoulders to the wheel, determined to make the machine work. There was no doubt the water carriage system was the best ever invented; it was the cheapest scavenger and carrier you could get. No doubt it was attended with disadvantages, but what system did man invent, which had not its disadvantages, and he believed, that system had fewer than any other, and if proper means were taken to prevent the access of sewage gas into the houses, the great difficulty would be overcome. He quite agreed that it was not in the large sewers the mischief lay, but in the connection between house and drain. The great fault of legislation consisted in allowing that connection to be made by improper parties. The sanitary authority of the town ought to see that the connection was properly made. Cheltenham was the first town which had adopted the idea of having tanks placed at the outfall of sewers, the system invented by his late friend, Mr. Dangerfield, who consulted him at all stages of its progress. At these tanks there were strainers, by which all the solid matter was kept back, and they were emptied twice a week. The sludge was taken out, and incorporated with ashes, and the compost was sold to the farmers readily at 2s. per square yard, and was found to be a very useful material, especially on heavy land with a clay subsoil. The liquid sewage was conducted to the sewage farm of about 200 acres, where irrigation took place. By that process they got rid of the sewage of a population of 42,000 from their own town, and of 10,000 more from two adjoining hamlets, at a cost of less than three-halfpence a head of the population, as all was done by gravitation alone. What they did, other places might do.

The Chairman reminded the meeting that the subject for discussion was the progress which had been made since last year.

Mr. Turner (Portsmouth) said it must be recollected, that formerly the population was a good deal more scattered than it is now; it had increased enormously in large towns, and the acreage which the town covered had not increased in proportion to the number. In the country a man might conveniently and properly use a privy, without being a nuisance to himself or his neighbours, by taking ordinary care, but in town, it was impossible to put 50 or 150 people on nearly the same space, and allow them to use privies. It became absolutely necessary to remove the sewage every day, and put it on the land. You could not make these people use the trains, as had been proposed, to go into the country, but must take the excreta to the land. He must say he had the want of elementary chemical knowledge attributed to Mr. Chadwick, for he believed the dilution of sewage was an important factor in sewage farming; if it were

used in too concentrated a form it would do more harm than good; and if it were absolutely dry, the plants would be utterly unable to assimilate it.

Mr. Harescough said the water-carriage system was very good for carrying away house slops and irrigating land, especially where, as in Rochdale, what was equivalent to 80 tons of soap was carried down the river every week, which would be very valuable for land. But, in his opinion, there was one point which gentlemen of the south did not seem to pay attention to. If you asked them what they did with the other refuse from the houses, they said they got rid of it, but did not say how. Now, he had recently visited the yard of the Sewage Commissioners in London, and he found there that it was sifted and separated; that the finest ashes were sold at 4s. per ton for mixing with clay to make bricks, and the cinders were sold to burn them, whilst the other refuse was burnt. Now, in the north they could not make bricks in that way, as the clay needed no admixture, and coal was so cheap that people would not burn cinders, and therefore these matters had to be dealt with to raise steam for evaporating excreta. Another point was the quantity of water used with the closet to carry away excrement, which he maintained was utterly insufficient for the purpose.

Mr. E. F. Bailey Denton then stated the substance of his paper, describing the system of irrigation adopted at Abingdon.

Mr. Chesshire asked if there were any storm outlets in the main sewer there?

Mr. Bailey Denton, jun., said there was one, but it was never used.

Mr. Chesshire asked what was the state of the sewage during a flow of storm water?

Mr. Denton said it was necessarily weak, but the land was so porous they could get rid of any quantity. Many of the houses were fitted with water-closets.

Mr. Sherman asked how deep was the underdraining?

Mr. Denton said from 5 to 7 feet; in no place less than 5 and often more than 6 feet. There was no clay, it was all loam and gravel. The water came out perfectly clear, and went straight into the Thames.

Mr. Spencer asked if it was filtered through pure sand?

Mr. Denton said through the natural soil which was there.

Mr. Spencer said he was the inventor of the intermittent system of filtration, and he thought his name might have been mentioned in connection with it.

Dr. Wright asked if the subsoil was not Oxford clay?

Mr. Denton said no; gravel.

Dr. Wright said that probably all over England they would not find a piece of ground where there were the same condition of things as at Abingdon. There was a large amount of oolitic drift, which was exceedingly porous, and wonderfully well adapted for that system.

Mr. Denton said that, in fact, the soil was no better than many other soils, though it was better than it need be.

Dr. Wright said he knew the cost at Merthyr Tydvil was very great, because things were not so advantageous there, and he could not make out how it was so different at Abingdon; but, looking at the geological character of the soil, he could now see the key to the mystery.

Mr. Austin asked to what depth the gravel ran, because the sewage must percolate through till it came to the clay, which would check any further filtration?

Mr. Denton said the gravel went deeper than they wanted to go. He could not say the exact depth.

Mr. Spencer said he might state the principle on which this intermittent filtration acted. If the sewage were filtered through mere sand without any ferruginous material at all, no purification whatever would take place. The first experiments he made were for the Corporation of Liverpool, in 1852, when it was discovered that when they had ferruginous matter in the sand it purified better than without, and that very fine white sand did not purify at all. When they had a pair of filters, so that one was lying fallow while the other was employed, it worked better, and when they added iron, especially magnetic oxide, the purification was perfect. The filter beds laid down at Merthyr Tydvil, and other places, all depended upon the ferruginous matter in the sand. He applied the same principle to the sewage water of the Calder, which was now being supplied to Wakefield. When he was called upon to advise at Abingdon, he could not get them to understand that it required a pair of filter beds, and that one would not do, but they got about 20 tons of ferruginous material and made a filter bed of it, and since that he had heard no more of it until he was told that Mr. Bailey Denton had made filters, and he had reason to believe that the ferruginous material was there mixed with sand. Whenever he had very impure water to deal with he always filtered it intermittently.

Mr. Cresswell called attention to the fact that his challenge had never been answered. The only attempt at answer was that of Sir Henry Cole, who alluded to what had been done with 1,000 water-closets at Burnley, a town containing 50,000 people. That would probably represent 45,000 whose sewage or refuse was dealt with in another way. That was hardly an illustration of the enormous pollution going on all over the country, not in such water as the Pendle water, but in the main arterial rivers to which he referred, which were spoilt for our industrial needs. Dr. Syson remarked that he thought there was some element of progress since the last Conference, and that was in the fact that an Act, called the Rivers Pollution Prevention Act, had been passed, and he alluded to the existence of that as a sign of progress. They all hoped it would be the means of procuring that progress, and he remembered that the Chairman had expressed his approval of it. It came into operation on the 1st August, 1877, and he had watched its progress, and advised upon it in many cases, and could tell them, as a lawyer, it was almost unintelligible in itself, and most difficult to work. It could not be put in operation except by the sanitary authorities, or by individual complainants through the Local Government Board, who might be pleased then to put the sanitary authority in motion. Any sanitary authority which attempted to deal with polluted rivers must go and ask for the consent of the Local Government Board. A question had been asked about it in the House of Commons, and was answered by Mr. Sclater-Booth to the effect that something had been done towards putting it in operation, and he mentioned six places, but he did not say that in any one the Act had been put into operation, or that pollution had ceased, but that there had been certain preliminary negotiations. As a fact, he happened to know that an attempt was made to put it in operation at Hertford, which, for certain reasons he need not go into, had failed. Several attempts had been made elsewhere, and they had all ignominiously failed; but the other day he was happy to say, the County Court Judge at St. Alban's had fined certain parties £25 a day for polluting the beautiful stream there, and that, he believed, was the only progress which had been made.

Dr. Wright said that in two cases he knew the very fact of the existence of the Act, and threatening to take proceedings under it, would enable them to deal with some troublesome people, and make them perform their duty. Still, he knew there was so much difficulty with it that it was almost a dead letter.

The Chairman said he had never expressed an opinion that this would be a working measure, but he thought it would be a statutable admission of a right, and that when it was proved to be unworkable it would be amended.

Mr. Chadwick said he had recently heard from America of an improvement in a flushing machine for tanks or cesspools, by which the contents could be emptied into a subterranean drain under the land, and that great success had attended this method.

The Chairman then requested the Congress to pass to the next subject, namely, the means of preventing sewer gas penetrating into houses.

Dr. Ainley referred to the paper he had contributed, and explained the diagram, which showed how Mr. Stott's system had been applied to Smedley's Hydropathic Establishment at Matlock. It had also been applied in many other places, where it was found to work satisfactorily. Last year it was supposed that the first open grating would take in the whole of the required air, and so prevent its efficacy. But such was not the case, for he had made experiments in connection with the borough analyst of Huddersfield, by putting in sulphuretted hydrogen and vitriol, and applying the test paper at a distance of 300 or 400 yards away, close to the boiler, and found that the gas passed over that distance in about twenty minutes. The time required would depend on the number of intermediate openings.

Mr. Chadwick said the use of tall chimneys for carrying off sewer gas had been adopted in various places, with a certain degree of success, but still the gases, though changed in character, were not absolutely pure, and they were spread about the neighbourhood. There had been a plan devised for ventilating all the sewers of the Metropolis in that way, but it was found that it would have required more chimneys than steeples, and then would not have produced a pure atmosphere. The best way was to prevent the production of the gas itself.

Dr. Ainley said the gases were passed through a furnace fire, and the worst of them were consumed.

Mr. Hawkins asked if there were any instance of the traps and the gullies being emptied by the furnace?

Dr. Ainley said the current was not strong enough for that.

Mr. Harescough said they had to draw away impure gases from their machines, for the purpose of consuming them, and employed one of Baker's blowers, as it was called, which, by the application of a two-horse power engine would draw away 100,000 cubic feet per hour. This gas, when sent under the fires, increased the draught of the chimney so much that they were able to do with nothing but cinders or vegetable refuse, for the purpose of raising steam. His opinion was, that if a few of those blowers were distributed about a town, and connected with the sewers, they would draw out all the impure gases.

The Chairman asked if any impure smell were noticed at the traps or gullies?

Dr. Ainley said no. That was equally true of the drop pipes leading to the houses.

Dr. Vacher said a modification of this system had been for many years adopted at Birkenhead, but instead of taking sewer gas beneath boiler furnaces, and then consuming the gas, they connected the sewers with the chimney stacks. Of course the air at the lower part was at a very high temperature, so that the air was sucked out of the sewers, and was then delivered at the top of the chimneys at such a distance from the houses that it was supposed not to be injurious. He did not think this was so good as Mr. Stott's method, because it was better to burn sewer gas than to take it up a tall chimney.

Mr. S. Alcock said sewer gas escaped into houses in two principal ways: In the first place, through the sinks, and in the next, through the soil pipe connected with the water-closets. He had found that the most effectual means for preventing that was, wherever practicable, as it was in most cases, to keep the connection with the kitchen sink outside the house, and let it fall on to a gully trap. That same system had also been applied in connection with water-closets, by letting the soil pipe from the water-closet, when it came outside the house, open into a spout head, so that any sewer gas which came up from the sewer went into the open air. The most effectual means was to make as many openings into the open air as possible. The only effectual way was to prevent any connection with the sewer going into the house at all, and that was what they tried to introduce into new houses. The great evil was the system by which house drains were laid. In Sunderland, they had a most efficient system of sewers. But after they had laid them down they found they were no use unless the house drains were properly laid, and frequently they had to be done three or four times before they could get a fall to the sewer instead of to the house. The cause of that was, that a great number of buildings were put up for sale; they were not built by the owner, but by speculative builders, who paid not the slightest attention to any correct method of laying the house drains. They had frequently contended before the Local Government Board, and that Congress last year had passed a resolution, that the laying of the house drains ought to be the duty of the local authority. It was analagous to the case of gas and water mains. Would any gas company allow each proprietor to make his own connection with the company's mains? If they did, the escape and waste of gas would be enormous; but they insisted, very properly, that no connection should be made except by themselves; and the same thing should be done with sewers. All these drains ought to be laid by the sanitary authority, which could carry them out far more cheaply. They were bound to give notice to the sanitary authority before making the connection with the sewer, but very frequently they did not do so, and after the houses had been occupied for three months it would be found that there was no connection made whatever. It was also found that the builder would make a drain 10 or 12 ft. to connect it with the main sewer, and then found he had not hit the right place. Then, instead of opening it out until he found it, he would frequently make a hole in the pipe anywhere, and trust to chance. The law forbade this, if you could find him out; but in a large town it was next to impossible to keep such a supervision over the connections as to prevent these things occurring. If this were attended to by the sanitary authorities, you would get the full benefit of the water-carriage system, there would be no sewage gas coming into houses, and the complaints made of the system would cease. He hoped the Conference would again take up the question of house drains. He believed one objection was that it was interfering too much with the rights of owners of property, but his view was that no one would be more indebted to the Government than those owners themselves, because it would increase the value of their houses. The work would be done properly and at a less cost.

Dr. Wright said he did not suppose anything said at that Conference would tend more to bring about an improvement in the sanitary condition of the population, than if the last speaker's observations were carried out. From his experience as a sanitary officer for many years, he had found that the *fons et origo mali* was the imperfect connection of the sewers with the houses. The only question was, how cheap the thing could be done. The next point was, the importance of carrying all these

sink trap out of the house, and there was no difficulty about it.

Mr. Chadwick said he had intended to have brought forward a quotation he had recently received from America, to the effect that public authorities should be not only entitled, but bound to carry away the sewage, as part of the general system of having complete control and responsibility for laying down drains.

Dr. Elliot said—Mr. Alcock has so intelligibly spoken, as to leave but little to be said by anyone following him. The general facts have been established, that sewer gas, an extensive cause of illness and of death, had, through service or connection pipes, been poisoning the air of our dwellings, that these service pipes are frequently not honestly jointed with our towns' drains; that the towns' drains are seldom efficiently ventilated; and to render the regurgitation of this gas into our houses impossible, and to make it no longer a source of anxiety, the effluent pipes, of the bath and of the sink, should be conducted to the outside of the house, where they should openly pour the waste water on a properly trapped gully, to be thereby passed into the general drainage of the town. But what of the water-closet? The soil-pipe is the most dangerous of all our effluent pipes; yet it cannot, like the others, be laid outside the house-wall, and there abruptly cut off and allowed to pour the sewage upon a gully for transmission to the main drain. We may see many ingenious devices in our museums, and abundantly advertised, each announced as an infallible remedy; and these, although really, in most cases, very injuriously arranged, are but delusions. The simple and very uncostly, yet manifestly reliable, plan, which I have adopted for nearly 20 years, is to discard all these patents and contrivances (for preventing gas from closets polluting the air of the dwelling) by the common-sense plan of placing this treacherous appendage to our modern houses outside and against the outer wall, but without any direct communication with the house, from which, under complete shelter, it is readily accessible at any hour, or in any weather, and in slippers. I use the tank-closet, as supplied by Messrs. Macfarlane, of Glasgow, the iron trough of which measures about two and a-half yards in length internally, thus allowing of a child's seat, nine inches high, at each end of the adult seat which is sixteen inches high. At each end of the tank is the working machinery or gear; one the water supply with its ball tap, the other the strong lever for the outlet. Such a closet can be placed on the ground level, or at any height whatever, either upon iron pillars, or on supports of brick or stone. Above the door frame is a simple and efficient contrivance for ventilation and light, to the exclusion of rain and of draughts, consisting of bars of plate-glass, arranged as in a venetian blind or louvre windows, only fixed in a frame eighteen inches square, and a similar ventilating window is placed in the side wall at the same height from the floor. The lever for the outflow of this very economical closet (not half the cost of the pan-closet, and scarcely ever, by any chance, going wrong even in the longest frost), has only to be used once a day, nor in frost need it be used for many days until the frost has gone. It is unlike the pan-closet, the machinery of which has to be noisily rattled after each time of using, is heard in other rooms, requires some intelligence and attention from every one using it, and is now and again going wrong, especially in frosts, and is a constant source of danger and anxiety to those who have these health-destroying closets inside their houses, where not one should ever be. The mention of a great and realised fact I may emphatically conclude with. It is this. That typhoid fever prevails pre-eminently more amongst the wealthier classes, who have closets within their houses, than amongst the humbler classes who have outside closets. In 1876 and in 1877, in Carlisle, we had the rate of death on several occasions drawn as low as eleven per 1,000, never lower. This for an urban population is wonderful.

Mr. Hamilton observed that all the powers wished for by some of the preceding speakers were already in action within the City of London. The Commissioners of Sewers assumed to themselves, by what legal powers he knew not, to do now with all new houses and with all old ones which came under their jurisdiction what was contended for; and he believed from frequent personal inspection, that the City of London proper was especially well sewered, and that the house connections were admirable. It was a great pity the same powers were not made universal.

The Chairman said the great advantage of Mr. Stott's system of ventilating was that it created a great draught. He knew it had been successfully worked in Halifax, which was a manufacturing town, but it would not be practically applicable when there was not a sufficient number of furnaces. In Halifax there were many furnaces and steam engines, and the furnaces were connected, by the leave of the proprietors, with the sewers, and thus the impure gases were drawn away.

Mr. North (of York) asked whether the fact had been taken into consideration that the outlet of the ventilation probably had much less area than the number of pipes connected with it. He understood that, in consequence of this, it would be impossible to set up anything like an active current extending over a great area, and that Sir Joseph Bazalgette had said, over and over again, it was quite impossible to ventilate any large area by that system adopted at Halifax. He did not think the condition of houses would ever be satisfactory until not only the house drains were laid by the local authorities but until there was some authority which should dictate how these things should be done. He thought they would all agree it was very desirable that no sewer should pass under the house to a greater distance than was absolutely necessary, but in many parts of the whole town, it was necessary that the drain should pass from the back of the house to the front. He knew practically that many respectable builders would lay drains under houses without the smallest attention to the size or the level at which they were laid, and thus a constant leakage occurred for want of proper packing. It was an important matter the health of towns, for they should not only preserve the air within the dwellings from pollution, but it was also equally important to take care that the subsoil under the houses and streets should not be contaminated by the escape of sewage. It was within the knowledge of officers of health that the subsoil was often laden with sewer emanations, and became very little better than a cesspool. He therefore hoped the Conference would see its way to a positive expression of opinion that the local authorities ought to have some control over laying the house drains, and some emphatic regulation by which this should be done effectually.

Mr. Turner said that all sanitary authorities had bye-laws in their own districts, the surveyors went to see that the drains were properly laid, and the connections effectually made. In the case of the drains going under the houses, they were required to be laid in concrete, and the points well secured. With reference to the escape of sewer gas into houses, they would all agree that there was one point to come before that, and that was to prevent the formation of sewer gas. They heard a great deal about water-closets, and in the new schemes proposed for the drainage of towns that was generally adopted, but often the sewers were made and water-closets connected to it, without any supply of water being provided. It was a mere truism to say that with a water-carriage system you required water to carry it, but he knew that even in many tradesmen's houses

there were hundreds of water-closets depending simply on common flushing to cleanse them. Until this evil were removed, they would never get rid of sewer gas.

Mr. Cresswell asked what was done at Halifax when the factories were not at work, which, he believed, was about 56 hours out of the 144?

The Chairman said, in Halifax, Stott's system was considered rather as an addition to other methods of ventilating the sewers, than as something to be entirely relied upon. Of course, the furnace was not always going, but it was not often let out, though then, of course, this advantage would not be obtained. Still, it was a method which could be conveniently and easily employed in manufacturing towns. Nothing could be more clear or lucid than Mr. Alcock's speech: he had said nothing with which they did not all agree, but he hoped it would not be imagined that he wished to detract from the merit of his statement when he said, in justification of previous Conferences, that that was not the first time they had discussed and arrived at conclusions upon this very question. In his opening speech, in 1876, he had referred to this matter, and had expressed his conviction that they could not hope to have an efficient water-carriage system unless the sanitary authorities in charge of it were also in charge of the connections of the pipes and the arrangements within the house itself. After each of these Conferences, the Executive Committee had summed up the results of the discussions, and in those conclusions, in the year 1876, this very point was prominently alluded to. Last year a good deal of time was devoted to this particular question, and the wall was covered with diagrams of different methods for preventing the ingress of sewer gas into houses. The conclusion then arrived at was that, although it may not be a perfect method, the most simple and obvious mode was to cut the connection. That principle was adopted by a great many sanitary engineers, and was beginning to be extensively carried out. At the end of the discussion last year the conclusions were again summed up, and the importance of this matter being placed in the hands of sanitary authorities was again pointedly referred to. On that occasion he ventured to use this argument. You have given the local authority the right to compel you to drain into their sewers, but that very right implies a corresponding objection on the part of the local authority, first of all, to take away refuse from the houses if the drains are properly connected with the sewer, and, secondly, to prevent the ingress of the sewer gas, which that sewer system created, back into the house itself. He took it, that was the moral obligation of the sanitary authority, and he did not see what answer they could make to the ratepayer whom they compelled to drain into the sewer and taxed for the purpose, unless it was that the law did not at present give them sufficient power to fulfil the obligation which the law itself had cast upon them. He did not think the law had given them sufficient power. The exceptional powers possessed by the Commissioners of Sewers in the City of London had been referred to, and in his opening remarks on the Public Health Act, passed in 1872, under which the sanitary authorities of the country were constituted, he had referred to that as a precedent. That Bill consisted of two parts, the first was constructive, which was passed, and the second dealt with direct emendations of the law which he had to sacrifice in order to carry the first. In that second part was a clause, which he, in his own mind, always called the Florence Nightingale Clause, because she had suggested it to him; a clause giving the local authority absolute power within the house as well as outside, over the pipes, drains, and connections, and imposing upon them the duty of seeing to the efficient condition of those pipes and drains. It was so phrased as to suggest, to the mind of the Legislature in the first instance, and the ratepayer in the second, that a right was being conferred upon the ratepayer of calling upon local authorities to guarantee him as to the healthiness of the interior of his own house. He was conscious at that time that the Commissioners of Sewers actually had those powers, and if it had come on for argument he should have rested his case very much upon that precedent. That created considerable apprehension amongst some of his own political friends, and in the department itself. It was felt to be a strong proceeding, and it was doubted whether the House would consent to it, but he felt it was the only remedy, and that if there was a right thing to be done, he ought to try to do it, and if the second part of the Bill had not been withdrawn, he should have tried hard to get it accomplished. During two years they had discussed this question, and had arrived at conclusions which had been formulated and put upon record by the Executive Committee. The subject had again been raised to-day, and it would be well worth considering if, instead of simply leaving it to the Committee of the Society to draw up conclusions, the Congress itself should not pass some resolution to the effect of the suggestion of Mr. Alcock.

Mr. Alcock said he would prepare a resolution and submit on the following morning.

The Conference was then adjourned.

The Conference was resumed on Friday, May 24th. The Right Hon. James Stansfeld, M.P., in the chair.

Papers on the "Discharge of Sewage into the Sea" were read by Mr. Henry Robinson, C.E., and by Mr. Schoolbred,

Dr. Domenichetti said that he came there with a view of eliciting the opinions of gentlemen in regard to the discharge of sewage into the sea. His remarks would apply more especially to a rising watering place on the coast of Lincolnshire. It had been recently decided that the sewage should not be discharged into the sea, the decision being based, as he conceived, upon erroneous grounds. Intermittent downward filtration was now occupying the attention of the authorities, and his opinion was, that in the first instance it was desirable to drain into the sea, inasmuch as the report of the Royal Commission on this subject went, he believed, to show how very desirable it was wherever opportunities and facilities were given for the purpose, and that it was preferable to all other methods. He might mention that this was a small and comparatively young rising watering place. They had obtained the consent and sanction of the Local Government Board, and the money was granted for an extensive system of deep sewage with a discharge into the fore-shore below water mark. It was conditional upon the sanction of the Court of Sewers, and there the obstacle occurred which prevented the fulfilment of the design. The Government had granted money conditionally upon their sanction, and they had issued a protest, and had refused their consent upon the pretence that the sea defences, which were under their charge, would be endangered by the penetration of a 12-inch iron pipe, which formed a necessary part of the sewage scheme. He thought that this was a great mistake. The expenses of the undertaking had been calculated to be no more than £1,800. The plans had been admirably carried out, and had been approved by the Local Government inspector, and that gentleman was an officer of the Local Government Board. He wished to bring before them the importance of employing an officer who was a professional man. The scheme had received the sanction of Major Tritton, the inspector

but as he (Dr. Domenichetti) had already told them, it fell through entirely from the Court af Sewers refusing sanction on the ground that the defences of the sea would be endangered. The Court of Sewers had no suggestion to offer with regard to the drainage of the place, except that they should resort to intermittent downward filtration, which meant the purchasing of land, which was very expensive, and also the setting up of pumping engines, as they could obtain no outfall without expense. He should be very glad if some gentleman present would favour him with his opinion as to the relative value of the two methods proposed. The local authorities were very much perplexed, and he should be glad to carry down to the country an expression of opinion which might in some measure guide and regulate their future conduct.

A Member—Might I suggest, Mr. Chairman, in answer to the question put by that gentleman, that he should refer that matter to the local officer, who is so competent to advise him. He would be, probably, the best party to advise in the matter—the same gentleman that he speaks of as a really competent man.

Dr. Domenichetti, in answer to the last speaker, said that he might explain that that matter was already out of the local officer's hands. It had received the official sanction of the Government, and had been highly approved, but a technical objection had been raised by the Court of Sewers, whose authority all the gentlemen present would be quite ready to receive as the paramount authority. In fact, an Act of Parliament would be necessary to override it. It was a very serious matter, and would, probably, become a matter of discussion in Parliament as to the limit of the power given to courts of sewers. It had been out of the hands of this officer, whose conduct had been highly approved by the Government, and the ratepayers, were now reluctantly obliged to have to resort to a very expensive, and in his opinion, a very unnecessary procedure.

The Chairman said that he thought that the Conference was hardly disposed, as far as he gathered, to enter into any lengthened discussion at present upon this subject, because they were awaiting a discussion of subjects for which that day had been specially set apart. What he would, therefore, say to Dr. Domenichetti was that, if time afforded, they would return to the subject before the Conference closed, and if time was not afforded for that purpose, he (the Chairman) would be happy to discuss it with him privately.

Mr. Young asked if he might be allowed to put just one question with regard to the paper of Mr. Robinson. What was the expense of the chemical treatment of the sewage, in the way he proposed, to get it into the sea, and to put the water into the sea in a pure form so as not to be a nuisance? It might be desirable that towns generally should have some idea as to what the cost would be. That was a very important item to the ratepayers. He might say that their sewer outlet was placed on the extreme eastermost point of England. It was a point where, whether the tide ebbed or flowed, no inconvenience was in any way felt, and the sewage was carried away without a very heavy cost.

Mr. Robinson, in reply to Mr. Young, said that it was a very wide subject, and he was not sure that the Congress would be pleased to go into the question. He should be very pleased to give any information after the meeting was over if he was able to do so. As to the cost of the treatment of sewage, they all knew that it depended upon the flow per head, the quality of the sewage, and many other points which it was impossible for them to go into with reference to any single place.

Mr. Alcock (Sunderland) said that in accordance with the views which he understood to have been expressed yesterday, and which had been fully discussed, to the effect that he should draw up a resolution bearing on the subject of the house drains, or the connection between the house and the sewers, he had drawn up the following resolution:—"That in the opinion of this Conference, the benefits to large towns of a well devised and effective system of sewers is very often entirely neutralised by the careless and improper way in which house drains in connection with such sewers are laid and connected with the waste pipes of the house; that all drains intended to be connected with the sewers of a sanitary authority ought to be made by such authority in the same way that house services are made by gas and water companies to their mains; that similar powers to those contained in section 37 of the 11 and 12 Victoria, 112; with corresponding duties should be conferred and imposed upon all local sanitary authorities." He had also intended, though he did not know that it was necessary, to propose:—"That the Society of Arts should be requested to urge these matters upon the Local Government Board either by deputation or otherwise." But perhaps that might safely be left in the hands of the Council of the Society.

The Secretary thought they had better add this further proposal to the resolution.

The Chairman concurred.

Mr. Alcock said that what he proposed to add with reference to that point was:—"That the Society of Arts be requested to urge these views upon the President of the Local Government Board by deputation or otherwise." He thought that this question was fully discussed yesterday, and he had already given expression to his views at some length, and therefore at present he would propose simply to submit the resolution, reserving to himself the opportunity of making any remarks if they should be required by the observations which might be offered upon it by any gentleman.

Mr. Turner, in seconding Mr. Alcock's resolution, said that he had had some little experience in connection with sewers. In the town in which he lived, the management of the drains was superintended by the authorities, and he thought that that was better than nothing; yet it would occur to anyone that, in a large town, the supervision could not be exercised in a strict manner. Frequently it was utterly impossible for the inspector to go round and thoroughly inspect the whole of the drains laid down in the course of the day, especially where drainage was going on very rapidly in the town. There was another matter, too, which would come entirely into the hands of the local authority, and that was the quality of the materials of which the drains were made. These were points in which the letter of a bye-law might be kept, while its spirit was evaded. He begged to thank Mr. Alcock for bringing this matter forward.

A Member asked whether there was any evidence before the meeting that the connections between the houses and the sewers were badly made. Under the Act of Parliament there was a man employed to see that they were properly connected. They were connected by the authority. So far as laying the drains from the house, he thought that it would be an improvement if those drains were laid by the authorities themselves.

The Chairman—I may answer you. I think it is in evidence before this Conference, and before the preceding Conference, that new houses are built, and that drains from those houses profess to be connected with the sewer, and that when the roadway is opened to examine the condition of those drains, they are found not to be connected with the sewer at all. That is in evidence before us, and many other minor defects are also in evidence; but the great point of this resolution, and I wish the Conference to understand its importance,

is this, that this would apply not merely to new houses There is the great point. I am asked, too, that the clause should be read to which this resolution refers. It is a clause of the Act 11 and 12 Vict. chap. 112, which was "An Act to consolidate and continue for two years and to the end of the then next Session of Parliament, the Metropolitan Commission of Sewers." It is the clause (s. 37) to which I referred yesterday, and it is an extremely comprehensive one. It is in these words—"And be it enacted, that all sewers, drains, watercourses, weirs, dams, banks, defences, gratings, pipes, conduits, culverts, sinks, vaults, cesspools, privies, reservoirs, engines, sluices, penstocks, and other works and apparatus for the collection or discharge of rainwater, surplus land or spring water, waste water, or filth, or fluid, or semi-fluid refuse of all descriptions, and for the protection of lands from floods or inundation within the limits of the Commission, shall be subject to the survey, order, and control of the Commissioners, according to the provisions, and subject to the regulations and restrictions of this Act." That clause is referred to because that carries with it the rest of the Act by reference. But to give some idea of the nature of the powers conferred, I had better, I think, in the first instance, show where the weakness of the present law is, and then how this law if extended to the country at large would remedy that weakness. Now, with regard to new houses, there is practically very little to find fault with in the law, and I will give you the best proof of it. I might, of course, refer to the various sections of the Statute of 1875, but a more practical course will be to ask your attention to a series of publications of the Local Government Board, entitled "Model Bye-laws," which they issue and which they recommend. I have all their model bye-laws here, and one of those, number 4, is "New Streets and Buildings," and I turn to page 32, and I find many regulations laid down in great detail, as to the construction of drains and the connection of those drains with the houses. Rule 60, "Every person who shall erect a new building shall cause the subsoil of the site of such building to be effectually drained by means of suitable earthenware field pipes properly laid to a suitable outfall whenever the dampness of the site renders such a precaution necessary. He shall not lay any such pipes in such a manner or in such a position as to communicate directly with any sewer or cesspool, or with any drain constructed or adapted to be used for conveying sewage." And similar but more detailed and stringent injunctions are contained in other regulations as to the communication of any of the pipes and drains of the houses with the outside drain leading to the sewer itself; for instance, in the 62nd Bye-Law. So that, I take it, here is practically proof, that in regard to new buildings, a local authority, if it chooses to adopt the model bye-laws issued by the Local Government Board, may, probably, efficiently and completely deal with the difficulty. And as, I suppose, before to-day is over, some gentleman, who is present, may handle the Local Government Board not in the tenderest way, and as I desire that it should be fully and freely criticised for the public good, I think it only right to draw your attention to the issue of those model bye-laws, which I take to be an instance of the Local Government Board doing precisely what such department ought to do. But now, how does this Commission of Sewers Act deal with the difficulty of existing buildings? Well it does so in this way, in clause 46. I will read the marginal note, I think that will be sufficient. I will read the text *in extenso* if you desire:—"After the issuing of the commission under this Act, no house to be rebuilt without proper drains." And then there is a second marginal note. It is this:—"If houses, built before the passing of this Act, are not properly drained, the Commissioners may order the same to be done." Therefore, there is no difference whatsoever under this Act between old and new houses as to the drains and connections coming under the control of the Commissioners of Sewers. The only want that I find in this Act, speaking from my recollection of it rather than from perusal of it this morning, is that I think it does not sufficiently distinctly impose a duty, and, therefore, I am glad to find in this resolution of Mr. Alcock, that he does not limit himself to propose that the powers of this Act should be conferred upon all local sanitary authorities, but that corresponding duties should be imposed upon them; and I hope that you will look at it from that point of view. Powers are not sufficient. You must impose duties, because a power may, or may not, be exercised. If a corresponding duty is not imposed, the probability is that the power will not be systematically and continuously exercised; and this particular power is of a value which will be useless in its exercise, if that exercise be not systematic and continuous. Practically speaking, it comes to this, if you have a well organised local authority, the local authority ought to have a complete set of maps of the whole underground sewage and drainage of the town, and of the connections with every house in the town, and every ratepayer ought to have a right to inspect those maps, and to be advised in case of need as to the condition of his own house, though, of course, he ought to pay the expense of putting his house drains in a proper state, if they are not so already. Nothing else than that, in my mind, will solve the problem. I see no objection to that. It is a simple business arrangement. Some people may start and shy at it, and say it is imposing too serious a responsibility, and conferring somewhat arbitrary powers. I look at it on the contrary, as a simple business arrangement for the good of society, and, if you will allow me to repeat an expression I used yesterday, a necessary arrangement, if the Legislature is to place the local sanitary authority in a condition to fulfil the obligations which that local sanitary authority itself incurs. The local sanitary authority calls upon the inhabitant ratepayers to drain their houses into its sewers; and by calling upon them to do so it undertakes a corresponding obligation of its own. And that obligation is a twofold one. First of all, it has to carry away successfully house refuse and sewage; and secondly, it is not to return it in that very dangerous and deleterious form of sewer gas into the house. Therefore, I very cordially approve of this resolution, and I hope it will meet the approval of the Conference.

A Member asked how far the regulation covered rural authorities? He apprehended not at all.

The Chairman—Yes, entirely. The resolution includes all local sanitary authorities.

The Secretary hoped that it would include the metropolis, because that was usually excepted from all sanitary arrangements, and it was more important, he thought, in the metropolis than in any other place.

The Chairman—We had better add the metropolis.

Dr. Wright (Cheltenham) said that it had been asked whether they had any evidence that those defective arrangements existed. A place had come under his own observation where they had spent £4,000 or £5,000 in laying out a system of sewerage, but there was no duty imposed upon persons to have the connections made by the sanitary authority. He had had several complaints, as medical officer in that district, of what they called a complete failure of the sewers, in consequence of the cheap rate at which some of the contractors made the connection. Some drains had been made in the wrong direction, so that instead of the sewage being carried into the drains with a proper fall, it went back into the house. It was one of the most important questions connected with the escape of sewer gas into the houses to have the connections entirely under the control of the sanitary authority. Persons objected, because they thought it was a monopoly, and that the matter should simply to be under the surveillance of the surveyor;

but many connections were made where no oversight took place, and where the evil was not detected until the mischief had been done. He had had to look at this question for years, and he was very glad to see that the resolution had taken the present shape; it had his perfect support, because he thought it was one of the most important resolutions that had been submitted to this Conference.

Mr. Cresswell asked Mr. Alcock if he intended that the duty should be compulsory and not permissive?

The Chairman said that he thought that Mr. Cresswell had better address the question of the interpretation of the resolution to the Chair. Undoubtedly, this resolution would impose a duty upon a sanitary authority, and the performance of that duty would be compulsory.

Mr. Cresswell said that he was much obliged to the President. The second question he wished to ask was whether all this was to be done by the sanitary authority at the cost of the sanitary authority, or whether it was to be done at the cost of the freeholder or the occupant?

The Chairman thought it was unnecessary to embarass themselves with that question. He did not mean that that question would not be easily answered, but it would, probably, make the resolution too long, and what they wanted was to assert the general principle that the control should be in the hands of the sanitary authority.

Mr. Cresswell said that that being so, he would not press the question. Of course he was in favour of further legislation, especially of compulsory legislation. He was going to make what might appear to be a somewhat discourteous criticism with reference to one of the phrases of the resolution, and that was the word "neutralise." He was not quite sure what the word "neutralise" meant. He did not wish to be hypercritical, but he thought the word "neutralise" was somewhat ambiguous. He would suggest an alteration, and that was:—"That the objects of the Act have been defeated."

The Chairman said that he did not wish the Conference to get into verbal discussion, but he had no doubt that Mr. Alcock would in some way meet Mr. Cresswell's view.

Mr. King (Mayor of Portsmouth), in support of Mr. Alcock's resolution, said that in his town they had the power of compelling the owners of property to see that their drains were in a proper condition, but had not power to do the work and charge the owner with the cost. In large towns very frequently, although the wishes of some of them might be to compel owners to join their drains to the main sewer, yet they had not the power to compel them to employ the local authority to do the entire work of connections and fittings; and, therefore, the majority of the inhabitants allowed these things to be done by private parties, and thus the evil, which Mr. Alcock had very properly complained of, was perpetuated. Those model bye-laws alluded to were all right enough, supposing they had no bye-laws of their own, but at Portsmouth they had bye-laws, and they could not now be amended without much difficulty. They wanted laws to make the owners of property connect the drain from the house to the main drain by the workmen of the local authority. He believed the connections and internal fittings were very often made in a very inefficient manner simply because the owners of property would employ cheap contractors, and thus sacrifice efficiency to false economy.

Mr. Hewson (Rochdale) said that he rose to support the motion, and to inform the Congress that much of the powers sought for by this resolution they had had in Rochdale for six or seven years, and he thought that they were almost as effective as the legislation suggested by the resolution. For instance, they had all drains laid by authorised contractors, exactly after the same manner as the gas and water companies.

The Chairman—Is that under the local Act?

Mr. Hewson said that it was. They had that power, and they used it very thoroughly. The net result to the ratepayer was a very great gain in point of cost, and the work, he was sure, was very much better done, for these authorised contractors worked under a printed list of duties, so termed, which each of them signed when he was put on the list of authorised contractors. Among these duties there was the responsibility that, if it transpired at any future time that work had been done defectively, the contractor was liable to be struck off the list, and if his charge was exorbitant, an appeal was made, and the office regulated the same. He thought that they got much better work done than under the ordinary way. With regard to drains, they were all under the survey and control of the Corporation. They had, in fact, a clause very similar to the one which the President had read. It was—"All branch drains, whether within or without the premises to which they belong, shall be under the survey and control of the Corporation, and shall be repaired or altered and kept in proper order at the cost of the owners." They had another clause which said that—"All drains, as to size and inclination, shall be under the approval of the Council." They had also another clause, which said that—"All drains should be ventilated and trapped, and wherever it could be avoided, no drain should be under a building." He mentioned these things as being contained in an Act of Parliament instead of in a bye-law. There was one very serious question connected with this matter. If it were made compulsory upon Corporations to alter drains at the expense of the owner of the property, would not the door be opened to litigation in cases of defects occurring in these drains? He wished to support the motion, but still that was a feature which it seemed to him would militate against Corporations wishing to get such an Act of Parliament as the one proposed.

A Member—Has any action been brought against your corporation?

Mr. Hewson—No; we do not lay them ourselves. The owners of the property are at liberty to employ any of the authorised contractors. Those contractors are not the servants of the Corporation, but they act for the owners.

Mr. Chadwick said that the purport of this resolution was to do generally or extensively what had already been done successfully in different localities, and done in a way which removed the objections of landlords and all others on the score of cost. It had been done by private improvement rates. Under that system (the working of which it was evident, from the discussion generally, had yet to be made known) in some thirty towns or more, the whole of the works, from the water main to the house service pipe and from the sink and soil-pan to the sewer, had been done by a public authority under private improvement rates. Supposing that the work cost some five or six pounds, instead of its being charged upon anybody in gross for immediate payment, there was simply an addition of four or five shillings made to the rate, and this rate the occupier paid as he had the benefit of the work. That plan was found to work exceedingly well, and to remove all those objections which might be raised. In this way the work was done at half-price. The occupier paid a penny a week or something additional in his rate for the convenience. He was the person who had to pay, and under those circumstances he did pay ungrudgingly. The persons who were offended by it were the plumbers and the private traders. The compulsory clause, he (Mr. Chadwick) begged leave to say, would be a great help to local authorities, who, when the matter was left permissive, were assailed by a number of persons having various interests, such as builders and plumbers, who said "You ought not to interfere with our trade." The compulsory power

would strengthen the virtue of the corporate bodies by enabling them to answer "We cannot help it; we must do it."

Lieut.-Col. Jones (Wrexham) said that he rose with great pleasure to support the resolution. He thought that if no other suggestion for improvement in legislation on sanitary matters was brought forward at this meeting, the Conference would have produced very useful results. His own observation led him to urge the resolution from the point of view of the gas and waterworks, the reason for making the connections in the case of gas and water being left in the hands of the companies, was that the gas and water were valuable matters which it was desirable to prevent from escaping, and, therefore, the common sense of requiring that the owners of those valuable matters should have the power of seeing that the materials, which they supplied to the householder, were not wasted, had ensured such powers being given to the gas and water authorities. There was a want of understanding with regard to sewage, either as a valuable substance in itself or as dangerous and a difficult substance, and, therefore, it was necessary to take care that it was properly dealt with. If the thing was viewed in that light, the parallel between the gas and water companies would become more evident than at first sight appeared. That was the light in which he had looked at the matter as a sewage farmer. He had felt that at the bottom the whole difficulty of sewage treatment was the excess of rain water and the uncertain quantity of rain water. He had put this both before the public and his own corporation so repeatedly that he would not go into it now. The resolution bore upon the powers of enforcing the proper treatment, because, although his Corporation had adopted a separate system with regard to all future sewage works in the town, still, when the sewers passed through very low-lying districts, where there was a great deal of rainfall, if the private owners had the power of turning all their rain water into the sewers through their house drains, the hope of keeping the rain water out by the adoption of the separate system by the sanitary authority was liable to be defeated. He thought that that was simply a matter of common sense that the private owners would see that it was to their interest that the Corporation should do the work, as they could do it more cheaply by a conjoint contract, under their own control, than the owner of the property could get it done. The Corporation could also see to their repairs in the same way. If repairs were wanted in water pipes, or gas pipes, everybody went to the company, or to one of the authorised contractors employed by the company. He thought that Mr. Hewson's suggestions in connection with Rochdale were very likely to meet the case. If there were authorised contractors under the control of the Corporations, the employment of them would answer as well as the Corporations themselves actually undertaking the work.

Mr. Holden (Hull) rose to express his entire approval of Mr. Alcock's resolution, and also his thanks to that gentleman for submitting it to them. He had hit the right nail on the head. As a medical officer, the great evils which he (Mr. Holden) had had to contend with had arisen from the very imperfect and scamped way in which the drains were laid down, especially in new tenemental dwellings. He would fain hope that the resolution would lead to the making the matter compulsory upon Corporations. He believed that if sanitation was to go on successfully, and the Public Health Act was to work well, the word "may" must be turned into "shall" in many cases. Those who had to do with large towns were painfully aware of the fact, that a large proportion of speculating builders got into town councils. How was it possible to expect them to do what they would call cutting their own throats. He made this statement advisedly, for he knew that it was an evil which really existed. If this Conference resulted in nothing but the passing of this resolution, or, at all events, in causing it to go forth that they, as sanitarians, were alive to the importance of this question, he for one should return to Yorkshire thinking that he had done well in coming, and he should be very glad to come again.

Mr. Lawrence Hamilton said that though it might seem a somewhat ungraceful and ungrateful observation, he could not help thinking that the wording of the resolution, which they had now the honour to consider, was not, perhaps, as carefully or judiciously arranged as it might have been if Mr. Alcock had had more time to consider that wording. Although the resolution was read twice, he (Mr. Hamilton) was not able to follow it very clearly, and he thought that it would be a mistake to allude to any Act of Parliament in the resolution, for nobody could be supposed to carry Acts of Parliament in his head. He would suggest a somewhat different wording in substitution, but he had written it in a hurry, and, probably, it ought to be reconsidered, and no doubt the Council of the Society would put it into a far better form than that into which he was able to put it upon such short notice. He would venture to propose the following amendment:—"It shall be the compulsory duty of the local authority to take into their own power and to complete the system of house drainage, which shall be executed at the cost of the ratepayers or freeholders, as in each case may seem desirable to the said local authority." The reason for giving some power to the local authority, was that it had to consider two totally distinct classes of property. Thus, if a freeholder owned a large portion of a town, or a county, it would be perfectly fair to make him pay for the work. But if a man had only a very passing and a very small interest in the property in which he happened to reside, it would be more a matter which ought to be taken in hand by the ratepayers in general under the Improvement Act, which Mr. Chadwick had alluded to with so much clearness and precision. He would venture, in conclusion, to suggest that if the worthy Chairman, whose enormous experience and clear head had taken in hand so many things and mastered them, would amend the rough wording of the resolution, he (Mr. Hamilton) would feel very grateful. He wished it particularly to be understood that he did not offer those words as a final or complete resolution, but he wished that some considerable improvement in clearness and legal diction might be made in the wording of the resolution.

Mr. Wild suggested, for the sake of saving time, that the amendment put forward by the last speaker should be withdrawn. If the Conference were to enter upon a question respecting the different rights and liabilities of owners and ratepayers, which really did not touch the principles of the resolution before them, they might involve themselves in a discussion which would last until they broke up that evening.

The Chairman—I was about, not exactly to rule this amendment out of order, but to say precisely on that ground that I should not advise the Conference to entertain the amendment. It is not simply an amendment upon the resolution, but it is a new resolution, and it enters upon a new subject,—that is the subject of the distribution of cost; and though that is an important subject, we are not prepared to enter upon it now. As Mr. Lawrence Hamilton has rather appealed to me in this matter, I feel bound to say that I had some hand in this resolution, which has been moved by Mr. Alcock. Shortly before I took the chair it was shown to me, and, as far as the time would allow, I made one or two suggestions which may be seen in my handwriting upon the face of the resolution. I am perfectly free to admit that, if time afforded, a more perfectly phrased resolution might be put together, and I am also ready to admit that there is something objectionable, *prima facie*, in the reference to the clause of the Act of

Parliament, with which it cannot be assumed that every member of this Conference is entirely and sufficiently familiar. I admit, therefore, that if you take this resolution as it stands, you take it somewhat on the faith of the statement of Mr. Alcock and myself with regard to the contents of that Act of Parliament. His object in inserting that phraseology was to avoid a very lengthy and detailed resolution. If the Conference do not like to commit themselves to the approval of a particular section of a particular Act, however it may be recommended to them, then it is necessary to fall back upon some general phraseology, which may, without much difficulty, be discovered. I think it is a fair way of putting the matter.

Mr. J. M. Fox (Cockermouth) said that he had asked the permission of the President to address the Conference on this resolution, because it bore somewhat upon the very interesting discussion which they had yesterday, in which the advocates of the water-closet were rather severely handled by members of the Conference. The question had been asked, whether they had it in evidence that the resolution of Mr. Alcock was needed. He (Mr. Fox) should say, in answer to that inquiry, what the botanist said in answer to inquiries about the commonest plants, *vide passim*. He wished to give to the resolution his most earnest support on the ground that, if the powers which were embodied in that resolution were conferred on authorities, nothing would more effectually tend to remove the objections which were entertained by many persons, in the year of grace 1878, to the water-carried system. There was a good deal said about connections. His object in supporting the resolution would be that under its auspices connections would also be made disconnections. And that was, he believed, at the root of the great objections which were supposed to apply to the water-closet system. As to the particular matter to which their attention was invited in the amendment which had just been put forward, his view was that the original resolution was intended to express a principle, and not to go into details.

Mr. John Walsh (Halifax) said that he quite agreed with the view that more power ought to be given to local boards than they possessed under the present Act of Parliament. Although the town from which he came did not find much difficulty in carrying out the various works required by the Act, in consequence of the duty not being imperative, difficulties did occasionally arise. Persons who had experience in town councils and local boards would know that, when works of this character were optional, they were often left undone. Whatever system was adopted for disposing of the sewage, even if it was the most perfect system, so long as the gases could escape from the main sewers into the drain and get back into the dwellings, there would be an evil. If a plan could be adopted that would disconnect the drains outside the buildings, so as to allow of the escape of gases before the drains actually entered the buildings, that would be the best safeguard against the sewer gases penetrating into the houses. With regard to the power which was vested in local authorities, according to his experience, it ought to be more comprehensive and binding, and not only deal with new drains and new buildings, but also with existing drains which were unsatisfactory. In such cases the local authority ought to have the power to insist that the drains should be put into such a state that they should be satisfactory to the surveyor for the time being. If the local authorities did not have this duty imposed upon them, no doubt local influences would oftentimes be brought to bear upon those bodies in a way which would prevent works being carried out as efficiently as they ought to be.

Mr. Yeld (Sunderland) said that he thought that they were all pretty well agreed, from the discussion that they had yesterday, as to the desirability of carrying out a resolution of this description. He, in common with all other medical officers of health, was impressed with the evil effects of the present system and the need of reformation. The only thing which he wished to refer to was the question which had been raised by Mr. Cresswell, as to the cost being thrown upon the owners of the property. Of course the resolution, in one sense, affirmed that the work should be done at the cost of the owners. What he wished to say was, that not only would it be to the advantage of the public health that the house drains should be laid by the local authority, but also it would be for the pecuniary advantage of the owners. The Corporation could lay the drains at a much cheaper cost than that at which the owner himself could get them laid. Cases had come under his observation in which contractors had laid house drains, and had charged 50 per cent. more than they would have cost if the Corporation had laid them.

Mr. Woodward, of Worcester, said that with many of the observations which he had had the pleasure of listening to he very fully agreed. There appeared to him to be very great difficulty in dealing with the question in anything like the manner which was proposed by the gentleman who moved the amendment. But it would be very desirable if the local authority could have perfect control over house drains. All drains to be constructed in houses should, first of all, be submitted to a competent officer of the local sanitary authority, whatever that authority might be. In that case they would make the sanitary authority in one sense responsible for the perfection of the work. But he would also make it compulsory for the officer of the sanitary authority to visit all the houses which were drained, and to see that the work was perfectly completed. He regretted to say that he was so unwell that he could not attend the meeting yesterday; and, perhaps, he might be allowed to make one or two observations with regard to a matter of importance which was then discussed, which was the economical disposition of the sewage. He very much regretted that he could not be allowed to speak on that point, because it was a very important matter.

Mr. Ryder (Mayor of Devonport) rose for the purpose of supporting the original resolution, because he thought that an absolute compulsory power, and the requirement that sanitary authorities should do the work themselves, would only prove efficient. He knew the importance of this subject, in consequence of the practical experience of the last few months. Several houses, which had been built within the last three or four years, were examined in consequence of some suspicion, and it was found that they had not been connected with the sewer at all. But while such things occurred, all the apparent control which existed at the present time must plainly be insufficient. He believed that nothing but adopting the course referred to in the resolution would have any absolute effect.

The Chairman—With regard to Mr. Lawrence Hamilton's amendment, I think that the feeling of the Conference is that we can not take it precisely as it is framed, because it includes matters which we are not prepared, at this moment at any rate, to discuss. But there remains the broader question which he has raised—whether it is advisable to pass the resolution as framed, or to pass some amendment of the resolution, which should avoid reference to the Commission of Sewers Act. Mr. Alcock's resolution, which I thought it right to state I had some share in, is in these words:—"That in the opinion of this Conference, the benefit to large towns of a well devised and effective system of sewers is very often entirely neutralised by the careless and improper way in which the house drains connected with such sewers are laid, and connected with the soil and waste pipes of the house; that all drains intended to be connected with the sewers of a sanitary authority, ought to be made by such authority in the same way

that house services are made by gas and water companies to their mains, with similar powers to those contained in Section 37 of the 11th and 12th Victoria cap. 112 (the Commissions of Sewers Act); that corresponding powers and duties should be conferred and imposed upon all local sanitary authorities, and that the Society of Arts be requested to urge these views upon the President of the Local Government Board by deputation or otherwise." It would be well to introduce the words, "The Commissions of Sewers Act," after the words "chapter 112" in the resolution, and also to add the words "including those of the metropolis," after the words "all local sanitary authorities." I have asked a very competent man, Capt. Galton (and there can be none more competent), to be kind enough during the last few minutes to draft an amendment upon this resolution, if it should be the wish of the Conference to avoid a direct reference to the Commissions of Sewers Act. The amendment which he has prepared, is this. The first sentence of the resolution recites generally the opinion of the mischief consequent upon imperfect drains and connections. Then, according to Capt. Galton's amendment, you, first of all, have the general proposition that mischief results from the existing state of things, and then you would have a proposal that all there is between the house and the sewer may be made by the local authority; and then, instead of that reference to the Commissions of Sewers Act, you would have these words:—"That all soil and waste pipes in and about houses, intended to be connected with the sewers of the sanitary authority, should be executed under the direct control of that sanitary authority, including those in the metropolis, and that it should be the duty of the sanitary authority from time to time to inspect them, and to see that they are in due working order." The are the two alternatives; I think either of these ought to be acceptable to this Conference.

Mr. Chesshire wished to suggest, before the resolution was put to the meeting, that this proposition would apply to those towns only which were well sewered. He had yet to learn where the town was that was well sewered. It certainly was not the town in which they were assembled. Nor was it any town that he knew of. Under any circumstances if the solid excreta passed into the sewer, the town could not be well sewered, and he thought that it would be desirable to leave out that portion of the resolution which referred to the town being well sewered. Let it apply to all towns whether they were well sewered or not. He would suggest that a Commission should be appointed, similar to the Railway Commission or to the Rivers' Pollution Commission, which should have control over the supply of water to towns and over the disposal of town sewage; such a Commission would be a very important body, and should consist of an eminent engineer, an eminent medical man, an eminent agriculturist, and an eminent financier, for the subject possessed all the aspects which would be dealt with by men of those four classes.

The Chairman said that he did not think the phraseology of the resolution was open to the objection which had been urged by Mr. Chesshire, for he did not understand the resolution as saying that the systems of water-carried sewage in existence were well devised, but that, however well devised the system of water-carried sewage might in any particular instance be, its benefit was neutralised if the connections with the house drains were not properly managed.

Mr. Alcock said that perhaps it might save time if he pointed out the fact that his resolution was simply intended to affirm a principle, and then virtually to leave it in the hands of the Council, as one of the speakers had said, to urge upon the Local Government Board; therefore, all questions of detail and wording would be far better discussed by the Council afterwards. They might simply pass the resolution as it was at first submitted. He believed that almost every gentleman there seemed to agree in the desirability of that course being adopted.

A Member suggested, as an amendment to the resolution:—"That the size, material, construction, and erection of every sewer shall be under the control and direction of the sanitary authority; and that no drain shall be covered over until after 24 hours of its being made."

The Chairman—I think that I do not incorrectly gather the general feeling of the Conference if I interpret it as being in favour of the resolution. Since I spoke I have made one slight alteration in the resolution, which, I think, will really meet any difficulty which may exist in any one's mind as to our being too much tied to the provisions of a particular Act. It seems to me perfectly clear that what this Conference desires and sees its way to, is the conferring as much power and duty as possible in those respects to the local authority. I propose to alter the resolution by inserting the words, "powers as extensive as those conferred;" so that, you see, if, on closely examining the Commissioners of Sewers Act, we should find that there was any little deficiency in the powers conferred, as well as in the duties imposed, it will be open to us to remedy and to supply that deficiency. Well, unless anyone wishes to insist upon proposing an amendment, I shall put the resolution to the Conference.

The motion was then submitted to the meeting, and carried unanimously.

The Chairman—The next subject which we had better open before we adjourn is—"Whether any further legislation of a compulsory or permissive character is needed for bringing about a better sanitary condition of towns or dwellings, or any change in imperial administration."

A paper on "The Necessity of Further Sanitary Legislation, and the Progress, if any, made in Treating Water-carriage Sewage" was then laid before the meeting by Mr. C. N. Cresswell.

Sir Henry Cole—You may imagine that, when I am going to say a word or two as advocate of the Local Government Board, I shall not occupy your time more than ten minutes. The Local Government Board was invented in order to help the people to get better health; but we cannot expect governments to be wiser than the people themselves. We must accept that as a first principle. Our political system may bring to the summit some exceptional people; but if they are to administer for the health of the people, they must know what the people want, and get experience and knowledge from their views. Now, undoubtedly, the Local Government Board helps us a little in this way. I am bound to say, with regard to this question of irrigation, being a question in which I have taken some interest, that in the last report of the Local Government Board, no doubt prompted a little by the Society of Arts, they are following the lead of the Society, which is wise. Well, I give them credit for that; but I do not think that they ought to stop there, I do not think that it is the business of the Society of Arts to do the imperial Government's work in this question. You will observe that when they give this nostrum—an old-fashioned nostrum, indeed, which a former speaker has treated with the contempt it merits—irrigation—it is still their only nostrum for keeping rivers from being polluted. But we must give the Local Government Board credit for having at last got some doubts upon the subject themselves. For instance, take the report of two years ago, by Mr. Rawlinson, who, no doubt, much influences his masters, and who has done a great deal in this direction, but, like myself, is rather old, though we cannot help that. It is astounding how the Board can have the boldness to write what Mr. Cresswell has quoted, when they issue

the report signed by Mr. Rawlinson and Mr. Clare Sewell Read. In the eighth paragraph, page 13, they say, "that land irrigation is not practicable in all cases, and, therefore, other modes of dealing with sewage must be allowed." You have heard mentioned a dozen cases—I could mention a great many more—where the only answer they have to give is, "If you do not go to land and irrigation now, we shall compel you to go to it at some future time." I know a recent remarkable case, where one of the most eminent engineers of the day made a thoroughly practical scheme for dealing with the sewage of the town, and, after it had been completed, the answer they got from the Local Government Board was of that kind. The scheme was stopped, and, as Mr. Cresswell said, "They shove down your throat this nostrum of farming and irrigation." The things are mixed up together, and nothing is perfect except those two. By this means," my authority said, "you grow cabbages at sixpence to sell at a penny, and poison your neighbours with the stinks." Well, I think that we may maintain that the only function of the Local Government Board, in the present state of matters, is impartially to collect and publish all the information that they can collect, and not act as a Pope. The Registrar-General of Births and Deaths can tell us how many people die, and he gets into the question of health besides, and he gives statistics, and the facts come out, as a matter of course. Why should not this Government Board do the same? Why should not they tell us annually and in detail what the people are trying to grope their way into? Instead of that, they have made but a little beginning, and we must give them due credit for it; but why should not this come out systematically? One of the smallest points to come before this Conference came before us yesterday, and it is not out of court now. It is the question of the collection of excreta. Why should not the Government Board tell us all that is going on in this country, and the various experiences of towns in this country year by year. You will see how I will illustrate that point. Allow me to call attention to the simplest form of pail; and if the Local Government Board knows about it the Society may give them a silver medal. There is a great question on carrying this matter about towns, and patents are taken out for covers, more or less costly. I venture to say that not a single soul in the Local Government Board knows what Warrington has been doing. Now, in Warrington is a plain tub, which costs a few shillings, instead of any intricate method of india-rubber and iron, and the other contrivances for keeping filth from spilling. At Warrington they do nothing but have a piece of wood on the top of the pail. It is so simple that they ought to take out a patent for it. I have seen the whole thing at work. They put a cloth over the pail, and then they put this wood cover on the top of it, and they get no spill anywhere; and then they wash the cloth and wash the pail. That is the simplest thing and clearest out. But as to Mr. Solater-Booth or Mr. Rawlinson knowing anything about it, I doubt. It is by mere accident that you know anything about it, the accident being that I saw the thing at Warrington, and I said, "Do send this thing up to the Society of Arts, and show them what is the cheapest and simplest invention that is out for this purpose?" Now, that is the sort of thing that the Local Government Board ought to give us information about. There is inevitable ignorance. They ought to make it the business of its department to bring all these subjects before the public, and to do it periodically—not to do it by a jerk once in three years. A great many people do not know anything about this Blue-book of 1875. The Stationery-office can not afford to advertise it, and it is a mere accident if it happens to get out anywhere. Now, I say that that is the kind of duty which the Local Government Board is able to do. It is not difficult to make it competent. With respect to this question of getting information, I tried and got some information last night. I am told that Lord Stafford moved for a return of the urban authorities having over 5,000 people, to state if they have any water in their districts. Well, we do not see the return named in the papers. The return will be made after a year or two—not before, I think. It has taken three months to get an answer as to whether the return can be made or not, but at last the answer is obtained. Well, there is another return. Why, it was two years in gestation, and I dare say you gentlemen here do not know much about it. It is a return moved for by Lord Rosebery in the House of Lords. I wonder whether the gentlemen who know anything about it will put up their hands. Well, there are three hands held up—three shining lights. Now, this return is a return of every urban sanitary district in England and Wales having more than 5,000 inhabitants, giving the method by which the sewage and excreta are disposed of, and the method by which the sewage is treated before it comes to a stream, the name of the river which it pollutes, a description of the manufactures; the length of time the system has been in operation, and so on. And here is a most interesting return from all the counties of England, and if I were in the habit of making wagers, I would make a wager that not 25 copies of this book has been sold. But this is exactly the work which the Local Government Board ought to do. If they would only produce a work like this, and make it extensively known for the benefit of you gentlemen, they would be almost worth the money they cost. But they have not yet arrived at that stage of action. Well, you know, they certainly have no right to have prejudices, that is quite clear. We do not pay them to stop us in our progress in doing things, and their prejudice does stop us. We will not allow that if we can help it. You know the Society of Arts has got hold of the stick, and will manage to work it so that the Local Government Board shall not stop the sanitary work of the country. Well, now, I have only to say that I am thankful to the Local Government Board even for its very small mercies, but I think they want a hearty shove to give us a good many more. And, amongst other things, I should be delighted if we could nail them to the responsibility of the state of the metropolis; but, however, that is too great a business. You go and say that a drain pipe is out of order, and you cannot get any attention, and you cannot have it even from the Home Secretary. You know that the state of London throughout is excepted from all sanitary authorities. It is a sort of "Arabian Nights" fact that the Metropolitan Board of Works has a monopoly for polluting the Thames. That is the only body in the country that has the prescriptive right to be beastly and prejudiced. Well, then, when you come to look at it, they set up all kinds of men of science who are, no doubt, very profound; and treat the question so microscopically and scientifically that you get into such a fog that you do not know what to do. They get science to prove that this stuff going into the river does no harm at all. No doubt the next thing that they will do will be to prove that it is otto of roses, and I dare say that I shall get so confused on the subject that I shall believe it. But what does the pouring of this filthy sewage into the river mean? That the Board is afraid to pay for a clear effluent that is not stinking, which will only cost from 3d. to 6d. a head per annum of the population.

The Conference than adjourned for half an hour. Upon resuming—

A paper, dealing with the subject "Whether any further Legislation of a compulsory or permissive character is needed for bringing about a better Sanitary Condition of Towns or Dwellings," was read by Mr. Henry Robinson, C.E.

Mr. Lawrence-Hamilton said that he was sure that that love of fair play, which characterised all intelligent

men, would not be absent from them that day. It was therefore with considerable regret that he had heard a series of attacks made upon the Local Government Board, and one of them was associated with the name of a great pioneer in sanitary science—a man who, perhaps, with Mr. Chadwick, had done more for sanitary science than any man in existence. He (Mr. Hamilton) referred to Mr. Rawlinson, whose writings were full of learning and thought; and although Mr. Rawlinson has that day been blamed for being old by an honourable speaker, who was not at that moment present, he (Mr. Hamilton) did not consider that when a man was the leader of a young school of thought, and a young school of action, his being old was anything to his discredit. As regarded the Local Government Board, he (Mr. Hamilton) was certainly not their champion; but by a series of accidents, he was brought very frequently in their way; and he must say, with all due respect to the great luminaries whom he then had the honour of addressing in that room, that they would find at the Local Government Board men whose genius, integrity, experience, ability, and knowledge were quite as great as those of the gentlemen who were then in that room. When they had at the Local Government Board men like Rawlinson, Netten Radcliffe, Buchanan, Ballard, and Seaton, they might be content that such men had been selected by the Government. The unhappy feature in the position of the Local Government Board was that, at every turn and every twist, they were interfered with by no end of powers which acted against them. The Local Government Board had no money to carry out one-twentieth of the things which it desired to effect. The Local Government Board was appointed without sufficient money, and then, having insufficient funds, and insufficient local powers, it was blamed because it did not do an impossibility. Mr. Chadwick had just assisted him (Mr. Hamilton) with some notes from that copious encyclopædia which he carried in his head, and he had reminded him that the government of London, as regarded its sanitation, was in the hands of various offices. There was, first, the Office of Works. The Office of Works, as most of them knew, had all the London palaces under its control. Then there were thirty-six Vestries, each of which put its spoke in the wheel, occasionally, and very frequently, to hinder progression and to accelerate retrogression, which was the normal, the natural, and almost the necessary effect of the Vestries throughout the United Kingdom. There was then the City Commission of Sewers, and the government of the City of London itself. As they were well aware, the City was particularly well managed, and it had powers of its own. There was then the Metropolitan Board of Works, and they had certain powers. Mr. Chadwick had reminded him that in twelve miles of road in London there were nine jurisdictions. Referring to the attacks which had been spat at the Local Government Board, he would appeal to them, and ask how the Local Government Board, hampered, hindered, impeded, and thwarted at every step, could, without full powers, be held responsible, because the Government of the country had not given them that complete power which the Local Government Board ought to have.

The Chairman—I think I had better draw your attention to the fact that, as far as I have understood the remarks previously made, no attack has been made upon the Local Government Board with reference to the sanitary condition of London. It is perfectly understood that the Local Government Board has no supervising power over the London vestries or the Metropolitan Board of Works.

Mr. Lawrence-Hamilton said that he was grateful to the Chairman for calling him back to the subject, but he (Mr. Hamilton) had simply touched upon that because a certain amount of blame had been attached to the Local Government Board, and he wished to show what its real position was, because it might have slipped the attention of certain gentlemen present. With regard to an observation that had been made by an honourable speaker, alluding to the matters of irrigation and filtration, he (the speaker) conceived that the reports of the Local Government Board were very satisfactory and very full. The Local Government Board were of opinion that wherever irrigation and filtration by land could be had, that was the system to adopt. Individually, he followed that same school. They had been further informed that the Local Government Board was not worth the money it cost the country. It was upon that remark which came from a gentleman who was absent that he ventured to rise, and to state that he did not believe that such a wide and sweeping statement was borne out by fact. He had not in his memory the exact figure which the Local Government Board cost, but he knew that for the work which it did, that it was well deserving of the support and the sympathy which it had frequently received. An honourable gentleman had laid great stress upon a stink-tub, or stink-pail, or stink-pot, whichever it might be called, and had shown it to the meeting as a marvel of genius and a marvel of hygiéne. He (Mr. Hamilton) would appeal to them as individuals, and ask, whether they could have a better instrument for the distribution of zymotic or preventible diseases than that stink-rag which flouted round the pail. He was sorry that the gentleman who had referred to it was not there, but he must say that it was carrying the joke a little bit too far to appeal to them, as educated, scientific, or unscientific men, whichever they might be, that it was wise and judicious that such an instrument for circulating disease as that pail, should meet with the support of a Society of men capable of thought, reflection, and intelligence.

Mr. Monson, of Acton, said that he had listened with a great deal of attention to the remarks of Mr. Cresswell, and he wished to make a few observations on local board elections generally. He (Mr. Monson) had just contested an election, and he had found that there was no register of voters. There was the standing order of the Poor-law Board that the collectors should mark those persons who were qualified to vote, and there was a register for the election of guardians, but there was no register for the election of local boards. It was at the will of those persons issuing the voting papers as to whom they should issue them to. In the case of cottagers, the papers would be issued to those persons whom they could control, but those whom they could not control would be left out. He should like to know whether the Municipal Corrupt Practices' Act could be put in force with regard to local board elections. Perhaps it might apply at the present time, but it was not very clear whether it applied or not, and then the consolidated order of the Local Government Board, with regard to the conducting of elections for guardians, should apply with reference to the elections of local boards. In the recent election in which he had been concerned, the returning officer was a farmer, and he did not understand what was correct and what was not; whereas, if there had been a poor-law election, the returning officer would have been the clerk, a lawyer, who understood the Act, and the election would have been properly conducted. If the committee were going into the question of elections, he should be very happy to send them up several cases which had come under his notice in connection with such elections.

Mr. Alcock said that there were two points to which he should like to call the attention of the Conference, and which, in his opinion, required further legislation in connection with the Public Health Acts. Of course, in speaking upon this question, which was a very large one, each gentleman would, probably, give the effect of his own experience of the working of the Acts in his own district. There were two points which had struck people in the neighbourhood of Sunderland as points

upon which it was desirable to have further legislation. One had been already mentioned by the Chairman—the question of bye-laws relating to buildings. Most large towns had taken the opportunity, when they had found it necessary, to go to Parliament to obtain statutory enactment for their building regulations. No doubt they had found, as had been found in Sunderland, that bye-laws were to a certain extent unsatisfactory. There were very many questions raised in connection with the validity of bye-laws. There were very many questions connected with the expediency of bye-laws which were submitted to the Local Government Board, and upon the whole bye-laws were not found generally, to be the most satisfactory method of legislation in connection with sanitary matters. The metropolis had been referred to with reference to the subject of sewers. The metropolis had also a Building Act, and it was the opinion of gentlemen in Sunderland that there was no reason why there should not be a General Building Act which might be applicable to the whole of the country. It would be impossible, of course, to say that the whole of the building regulations should apply to every part of the country, including small rural districts. But the people of Sunderland thought that it would be quite competent to give to the Local Government Board a discretion as to applying portions of such a Building Act to urban authorities and to rural authorities, as they might from time to time consider desirable. For instance, what was a rural authority to-day, might in ten years' time become an urban authority, and, therefore, the building regulations that might be applicable to-day to a small rural village would require to be enlarged. This necessity would be entirely met if the suggestion which he wished to make to the Conference, was carried out, namely, that there was a general Building Act, and that certain portions of it might be applied to all districts, including rural and urban. Then, as a district came to have more of an urban character, the Local Government Board might have power to apply all the provisions to it, including those which applied more to an urban than to a rural district. As a rule, he had no complaint to make against the Local Government Board, except delay. He believed that they were as anxious to carry out their duties of a central character as local authorities were to carry out their local functions in their own districts; but in the operations of the Local Government Board bye-laws there was delay, especially in reference to building. They had had such an amount of work thrown upon them by the Act of 1872, and the Act of 1875, that they had hardly been able to cope with it. It took two years to get one set of building laws, in connection with a rural district near Sunderland, approved by the Local Government Board. Those rules were made applicable for six of their townships, but one township was omitted, as it was not then thought that it would be built upon. They very readily got the urban powers, for, in fact, the Local Government Board had shown a very great disposition, indeed, to give local authorities urban powers wherever they could show any reason for putting them in operation in their district. Shortly afterwards, the same powers were required for the township which had been omitted when the powers were sought for the other six townships, and the local authority thought they would have nothing to do but to submit the same regulations for approval with reference to the one remaining township, and would then be able to get them approved immediately. To their amazement, they found that such was not the case. They had to begin the whole question over again, and it took them 18 months to get a set of bye-laws for the remaining township. That was not the worst of it. When they had got the set of bye-laws for the remaining township agreed upon, after 18 months' discussion, tho local authority suggested that they might apply the same bye-laws in the other six townships, so as to have one uniform set of regulations for their entire district. They thought, "Now, certainly, we shall be able to get this agreed to without any difficulty;" but, to their amazement, they were told by the Local Government Board, that if they submitted a new set of bye-laws, applying to the whole district, they would be opening entirely the reconsideration from beginning to end. The local authority, were, therefore, under the necessity of declining to reopen the question, and of continuing with two different sets of bye-laws. There was no power given to a sanitary authority over the size of rooms. In Sunderland, they frequently had plans sent in showing bedrooms of very infinitesimal size; indeed, barely sufficient to hold a bedstead; and if they suggested any alteration they were met at once with the objection, that they had no power over the matter. With reference to the height of rooms, the Local Government Board had told the local authority that there were very considerable doubts whether they had any power over that point. He thought that it would be conceded that both the size of rooms and the height of rooms were very material elements in reference to the question of health. Now, they were submitting a series of bye-laws, and they provided in one of them that the yard or open space at the back of a house should have a certain fall from the house. In Sunderland they had a street on both sides of the houses, what was called a front street for the front doors of the houses, and also a back street for the back doors of the houses. They provided that from the house to the back street, or to the yard wall, if there was not a back street, there should be a certain difference of level —a falling away from the house—in order to secure drainage. The Local Government Board proposed to strike out the bye-law providing for that, and said that there was no power whatever to make a bye-law with reference to the level of the yards, or open spaces behind the dwellings. The local authority maintained that there was a power, because it was absolutely essential in respect to the drainage that there should be a fall from the house, and therefore they were to have an interview in the course of a few days, and they hoped to convince the Local Government Board that the requirement for the difference of level was within their powers, though at present they objected to it. Another thing which the Local Government Board objected to, somewhat to the surprise of the Sunderland authority, was a regulation with regard to the hearth-stones. The local authority provided that the hearth-stones should be embedded with a certain incombustible material, and they had received a reply which stated that hearth-stones were not within the Act. Another very important question, which had arisen in their district in reference to the building bye-laws, was connected with the making of streets or roads. A person would send in a plan showing streets with proper levels and everything else in order, and he would get it passed; but having got it passed, perhaps he failed to proceed to form the street, but sent in a plan for an individual house, or for a few separate houses, to be built in different parts of the street before he made the roadway. The consequence was, that it was very difficult to get the house built in such a way as to conform to the proposed level of the street, and it was very difficult indeed to get the street made within any reasonable time of the houses being built. He thought that there ought to be some power given to sanitary authorities, to say that, before a man began to build houses, or certainly before he began to build any number of houses in a certain street, he should form the street. He believed that in most districts in connection with the metropolis the streets were formed, levelled, and kerbed, even if not paved, before the houses were built; but that certainly was not so in the north of England, as far as he was able to ascertain, and the local authority did not seem to have the power to compel it. At Sunderland they proposed to put in a bye-law, saying,

that before a person began to build houses he should make a rough formation of the road, and put in a kerbed footpath, so as to show the level of the proposed street, but they were met by the Local Government Board with the remark that that was not within the powers of the Act of Parliament. Under these circumstances he thought—and he hoped that most of the gentlemen present would agree with him—that it would be very desirable to have a Building Act applicable to the whole country, with power to the Local Government Board to apply such provisions as they might consider desirable to the rural districts, and such as they might think desirable to the urban districts. There was only one other point to which he would call attention. There were others which he could name, but this was a point which he considered of very considerable importance, and that was the question of notice of infectious disease. At present the medical officer of health had no means of ascertaining where the cases of infectious disease arose within his district. There might be scores or even hundreds of cases where attacks of infectious disease had manifested themselves, and yet the medical officer of health for the district might be in entire ignorance of the fact. He did not think that any one would differ from the statement that it was very desirable that the medical officer of health should know at once of any case of infectious disease. He had no means of isolating the case, and preventing the spread of the disease, unless he was made aware of the fact of its existence. He (Mr. Alcock) thought that some person—probably the landlord's tenant, as it had been said in some of the papers that had been already presented on the subject, that is to say, the principal tenant of the house—should be compelled to give notice to the medical officer of health of the existence of infectious disease the moment it came to his knowledge. Some gentleman might say that it was desirable to impose that duty also on the medical attendant; but he (Mr. Alcock) was afraid that that proposal might lead to considerable opposition amongst the doctors, and therefore he was rather afraid to propose that. He would be content if the person virtually in charge of the house should be compelled to give notice of the existence of infectious disease as soon as its occurrence came to his knowledge, in order that the medical officer of health might take the necessary steps for isolating the case and preventing the spread of the disease. He might state that the practice pursued, with reference to schools, had been very objectionable in his locality. That was an item which must have come within the knowledge of a great number of medical officers of health lately, especially since the Education Act had been put into operation. The officers of School Boards found themselves in considerable difficulty in enforcing the attendance at schools on account of the existence of infectious diseases. The parents sometimes made the excuse that a child was ill. That was an excuse easily made, and if School Boards listened to it constantly, the schools would be neglected, notwithstanding that there might be no ground for the absence of the children. On the other hand, there were a great many cases of infectious disease, such as measles, which the mothers were able to attend to without the aid of a doctor, and in many cases the parents were too poor to call in a doctor. During the last week they had a case before the district committee of the Board of Guardians at Sunderland. When parents came in for relief in the ordinary way, they were generally asked the question, "Where are your children at school." Then they gave the name of the school, and the guardians turned to the books, which they had before them, to see what had been the attendance of the children. It was now compulsory upon guardians, before granting out-door relief, to see that children were in attendance at school. In the case which he had just referred to there were two children, one not in attendance, and one who had made ten attendances during the week, which was the full number. The committee asked the cause of the absence of one of the children, and they found that that child was suffering from measles whilst the other was in constant regular attendance at school. This was a very dangerous matter because, no doubt, there was a great risk of an infectious disease being spread through the entire locality and neighbourhood in this way; and, therefore, he thought that this was a question which called for legislation with a view to prevent the evils arising, both in connection with health and, virtually, in connection with education. He, therefore, trusted that it might be found possible to have more legislation upon that point, throwing the duty of informing the sanitary authority either upon the tenant of the house or upon some other person. He should be glad to hear the views of the Conference upon the matter.

Dr. Child said that he thought that the best, because the most general argument for further legislation upon these matters consisted in the fact, which he believed every one of them there would admit, that the legislation which they had at present had completely failed to produce the results for which it was intended. When he said that it had completely failed, he spoke advisedly, because he took it that no one would suppose that what might be called the mere removal of temporary nuisances was the object, or, at any rate, the sole object of the sanitary law, or that, if it were so, such object would justify the elaborate organisation and the enormous expense which was now spread over the country for sanitary purposes; but yet it seemed as to him that that was only matter in which they had been successful. He thought that it was impossible to doubt this, because the evidence to be derived from the reports of medical officers and others, really existed in such quantity, and they had had such a lot of it quoted that day, that it was really not worth while to take up the time of the Conference in repeating it. The evidence that they had got proved most conclusively that, so far as water supply, drainage, house accommodation, and the prevention of epidemic diseases were concerned, very many defects remained in all those particulars, and those defects, in many parts of the country, were scarcely less appreciable now than they were before the passing of the Act of 1872. He supposed that every gentleman present could point to villages and towns—and more particularly he might add, the growing suburbs of existing towns—in which all the old abominations of cesspools close to wells, and things of that kind were not only still existing, but increasing, and multiplying, and increasing, and multiplying at least, in as great a ratio as the increase of the population. If they looked into that question in connection with the increase of population, he thought that they would find that in the country districts and suburbs there had been no advance at all; all that they had succeeded in doing—even if they had done that—was to retain the *status quo* in which they were before the Act of 1872. He had always admitted that the passing of that Act of 1872 was the greatest advance which was ever made in this country in sanitary legislation, and he thought that the right honourable gentleman in the chair, whose name was connected with that advance, would be the last person to tell them that the Act of 1872 was ever intended to represent finality in the matter. He (Dr. Child) had ample reason to know and to say that the Act of 1875 had been, in a great measure, a delusion, and, considering the way in which it had been worked, he might almost say that it had been an imposition on the public. Let him put himself right about that matter. He would say that the Act of 1875 had been a benefit in one respect. Of course it had been an enormous benefit to their legal friends, who now really did know where to find the sanitary law, but he believed up to that time they found it exceedingly difficult. But he believed that that was not only the greatest, but the only real benefit, which that Act had produced. Nay, he would go farther, and would say

that that Act had tended to hinder sanitary progress, because the Local Government Board adopted that Act as a matter of finality, and they were always telling the public that they must be thankful for what they had got. The defects in the present law were of two totally different kinds, but, as time was pressing, he would refer to only one of them. There were defects which had been referred to again and again, and which the present Public Health Act Amendment Bill proposed to remedy in regard to one division of sanitary matters, namely, water supply. These were defects in the machinery of the Acts as they stood, and which were capable of being remedied by altering the Acts; but there were other defects of a more serious kind which affected the whole system and spirit of the sanitary laws at the present moment. Those defects were, first, the permissive principle, and, secondly, a double government in the way in which it was now carried out. With regard to the permissive principle, he could not for his life see what was the use of permitting certain persons to do certain things which they had a vast preponderance of motives to leave alone, and that was very much what was the case at the present moment. The law permitted a Board of Guardians consisting, he would say, of A, B, and C, to take certain steps on their own responsibility, and at their own cost in the way of trouble and care, and very much at the cost of themselves or of their immediate neighbours in the matter of expense, and these steps were to be taken for the benefit of D, E, and F, who were persons who contributed little or nothing towards the expense, for, after all, the question of sanitary improvement was mainly a question of the poor. The men who sat at the Board of Guardians could generally manage to have decent water to drink themselves, provided that they had sense enough to care to obtain it, and they did not care so much about their neighbours. That was a matter of human nature. They all knew that they looked out for number one first in a vast number of things, and in all commercial matters it was generally looked upon as a proper principle to do so, and the principle was acted upon accordingly. If they passed a law by which they permitted certain persons to do a thing it seemed to him that the very use of the word "permit" implied that they also permitted them to leave it alone. The two words, permission and duty, which, by-the-bye, were used almost in very same sections of some of the sanitary Acts, seemed to have no relation to one another. If a man might do a thing if he liked, it could hardly be, in any legal sense of the word, his duty to do that which he was only permitted and not compelled to do. It seemed to him, further, that the framers of the Act really saw this distinction, and it would have been odd if they had not seen it. He believed that the framers of the Act really did see the distinction perfectly well, and that that was the meaning of Part IX. of the Act as it now stood. Then, as to the second part of the question, it was the fact that, not only had difficulties arisen from the permissive principle, but they had also arisen from double government, which practically divided the responsibility so completely, that neither of the two parties concerned felt any real responsibility in the matter. The local body, as he had said, without entering into the question of proponderance at all, had a great many motives to induce it to leave matters alone, and the mere fact of feeling that there was a further body which could be applied to when the local authority failed, removed the sense of responsibility to a great extent; and when the local authority knew that that other body, if applied to, would be likely to leave the matter alone, that knowledge acted as a still further inducement to inaction on the part of the local authority. Then the Local Government Board had adopted the consistent policy of leaving everything to the local bodies that could be left to them. The constant reply to all appeals to them was, that they could not undertake to do the duty which really belonged to the local body, and so, between the two stools, sanitary improvement came to the ground. He could not agree with the gentlemen who had defended the Local Government Board, because if the clauses 299 and 293 were taken in connection, and really worked as their wording would indicate, the Local Government Board had ample power to compel every local body to do a vast number of things which at the present moment were not done. They all knew that a complaint being made under the Act was interpreted to mean a complaint, not by some officer of a local body, but by some person *ab extra*, and the Local Government Board would not act without such complaint. This amounted, in a vast number of cases, and especially where poor persons were concerned, to practically declining to do the work at all. He could not believe that the words of clause 299 alone necessarily implied that result, and he was quite certain that if that clause was read together with the 293rd clause it could not intend such a result. The words of the 293rd clause were these:—"The Local Government Board may cause to be made such inquiries as they see fit in relation to any matter concerning the public health in any place." Could they imagine words much wider than those of that clause? And when they remembered that the Local Government Board had a number of salaried officers of its own who acted as inspectors, and whom it might employ for any purpose, and in any place whatsoever, how it was possible to shirk the responsiblity which those two sections brought upon the Local Government Board, passed his understanding. The Local Government Board seemed to him to have carried the policy of "how not to do it" to a degree of perfection that was not to be found in any part of the world outside Turkey. He would only just say one word in conclusion, and that was in reference to something which fell from Mr. Cresswell with regard to the remedy which he proposed, namely, county government boards. If by introducing county government boards Mr. Cresswell meant to introduce them as proposed in the Bill now before Parliament, he (Dr. Child) should have great doubt of the advantage of them, the reason being that the Bill tended to multiply jurisdictions in country districts which were already most frightfully multiplied. They had at present, in the way of jurisdictions, petty sessional divisions, then Poor-law unions which were also sanitary districts, and then small local boards which were sanitary districts within the districts of Boards of Guardians; they had also highway boards, and parish committees. He must remind them that these authorities were constantly conflicting. Then there were unions which extended into different counties, and such practically had to work several different laws, because the sanitary law was worked through the clerks of the magistrates, and in one place, it would be interpreted by one lawyer, and in another place by another lawyer. Then there was sometimes a small urban district within the union, which for sanitary purposes had a district of its own. Suppose that in such a case there was an outbreak of small-pox. It would be found that the Vaccination Act was worked by the Board of Guardians, as a Board of Guardians, through their own medical officer and their union authority. All other infectious diseases were put under the control of the sanitary authority as a sanitary authority, and of the medical officer of health, as their officer for that purpose. These two different authorities might have, and frequently did have, two different areas of jurisdiction, and different officers who did not always pull together, as it might be wished they should do. That was a very strong point. Then there was one other point, with regard to the question of county government boards. He should like to see his way a little more clearly in regard to them in connection with the difference between the rich and the poor. In using the terms, "rich" and "poor," it is very difficult to avoid being misunderstood; but for practical purposes, when people spoke of the poor, they meant the very poor—the actual day-labouring class, and no one else—because

the small tradesman, or small lawyer, or any other individual of that class, was quite as much a rich man for practical purposes as the millionaire or the landowner. In fact, in some cases, he was more so, for they all knew instances in which, though the territorial aristocrat was a very great man indeed, yet his agent was a much greater man. He should like to see some device by which the interests of the poor in this matter would be protected, and if he was confident that the vote by ballot would protect them he should support it. He was not so clear on that point, and he could not help thinking that this was a matter which went a little beyond rural and local considerations, and affected the Local Government Board itself. The president of the Local Government Board was generally a Member of Parliament, and very often a county member. And in counties, at all events, the nuisance mongers had votes, and the sufferers from nuisances had none. He could not help thinking that that fact went far to account for the Local Government Board having done nothing.

Dr. **Montgomery McCurrey** said that it might be left to every reasonable man to bear out the assertions which had dropped from Mr. Cresswell that day. He felt it his duty to mention a case of which he was perfectly cognizant, and which affected the medical officer of health in a large district, for he believed that the case was one in connection with which good results would accrue from the introduction of the ballot. A medical officer of health in a large district lost his appointment simply because he did his duty, and gave offence on a military question to a gentleman who possessed and held a large amount of property in the part of the country where the officer was engaged. He had a number of the *militia* placed under canvas instead of being billeted on the property of the landed proprietor. There were only seventy-four billets to be obtained for a thousand men, and none of the billets could accommodate more than nine men, and some of them could accommodate only seven. The medical officer represented to the Local Government Board, and he represented to the Horse Guards, feasible and proper grounds why the thousand militia men should not be billeted in the town, and he requested that a medical officer might be sent down, either from the Horse Guards or from the Local Government Board in London, to inquire into the validity of his representations prior to any steps being taken. Two of the representations which the local medical officer made were that small-pox was prevalent within a few miles of the town where a number of the militia men were coming from, and that there was not sufficient accommodation for the men. This officer was a gentleman who had been 13 years a public servant in all parts of the world, but in consequence of his action in this matter he was dismissed from his appointment. He (Dr. Montgomery McCurrey) mentioned this case in order to bring before the Conference how guarded medical officers were obliged to be in carrying out their duty.

The **Rev. W. Freeman** asked for the attention of the Conference to a few words on the question of imperial legislation, as affecting small country districts. He could not do better than refer to two or three facts, and leave them to speak for themselves, rather than to occupy time in any other way. He came from Norfolk, and had the honour to represent the local board of a town in that county. Some time ago, the town was under the government of a rural sanitary authority, which consisted of the representatives of 64 parishes in the union. That authority determined upon a scheme for the drainage of the town in which he (Mr. Freeman) lived. The gentlemen who composed that rural sanitary authority, coming as they did from agricultural districts, were nearly all of them farmers, and had little or no interest in the township. An engineer was sent for, who prepared, at an expense of more than £700, elaborate plans of drainage and water supply, for a small town of 5,000 inhabitants. The scheme would ultimately have cost £30,000. It was a very beautiful scheme prepared by an eminent engineer whom he (Mr. Freeman) had had the pleasure of seeing in that room during the last four days; and the people of the town thought that it would be a very good scheme for a place like Birmingham, but that it was not adapted for so small a town, and it would certainly put upon them an intolerable burden. Some of them also had an objection to sewage irrigation, and the more so because it involved the necessity of having water as a carrier of sewage, and they had no water in the district. They were dependent for water entirely upon the wells which had been dug for each house in the town, and they would have been under the necessity of boring and expending a large sum of money in order to get water, not only to satisfy the natural and necessary requirements of the people in town, but to supply 100,000 gallons daily as a carrier for the sewage. They had a further objection to sewage irrigation. The townspeople, therefore, set themselves vigorously to oppose the scheme, and the result was the formation of a local board; but they found that the Local Government Board was so thoroughly committed to the plan of water-carried sewage and irrigation that the representatives of that Board, who, in all other matters, treated the local board with the greatest possible courtesy, treated them in this respect as they were told they deserved to be treated. They were told by Major Tulloch, only in March last, that they were among the bad boys of the country. The sanitary authorities and the local boards of the country were classed by the Local Government Board under two heads —good boys and bad boys. The good boys were those who adopted the scheme of drainage and sewage irrigation, which had been sanctioned by the Local Government Board; and the bad boys throughout the country were those authorities which had chosen to think for themselves, and who believed that sewage irrigation was not the only or even the best mode of disposing of sewage. Major Tulloch went further, and when he came on an inquiry as to improvement of the market-place, he said, "Gentlemen, you must not expect the Local Government Board to assist you in any of your schemes for local improvements, so long as you refuse to assist the Local Government Board by carrying out their scheme of drainage."

Mr. **Lawrence Hamilton**—Quite right.

Mr. **Freeman** said that this touched directly on the question which was before the present assembly, namely, the question as to how far imperial legislation and administration affected the action of local authorities with regard to sanitary improvements. He thought that such an assembly as that ought to clearly understand whether the Local Government Board would assist local authorities in country districts and small townships which were not able, like Birmingham, to make their voice heard throughout the country. If the Local Government Board had set themselves to oppose any improvement, whatever it might be, suggested by the local authorities, unless the local authorities would submit to be handed over to the eminent civil engineers of this country, to be dealt with by them after the fashion in which they certainly would be dealt with, and which was not always to the interest of the people, but generally to the interest of the civil engineer himself—if the Local Government Board determined to oppose any improvements in small towns until the small towns would submit to such a rule as that—the sooner local authorities understood it the better, and the sooner the Legislature of the country understood that this was the course taken by the central administrative authority appointed by them, the better for the people of this country. While large cities, such as London and Manchester, and towns like Birmingham, could always stand up and speak for themselves, and make their voice heard, the greater number of the

towns throughout the country were in the position of being tied and bound, hand and foot, by the Local Government Board in these matters of sanitary improvement. There were to be found in small towns men of intelligence, who knew what was right to do, and who had exercised their judgment in trying how to find out how to do it. And when local residents, who had given their time and attention for years to sanitary matters, found themselves fettered, their whole nature was stirred within them when they saw that sanitary and social improvements were impeded, and sadly impeded, by the red-tapeism of the Local Government Board of England.

Mr. Baldwin Latham said that he happened to be the "eminent engineer" that was called in by the rural sanitary authority referred to by the last speaker. The fact of the matter was, that he did not believe that there was a more conscientious or competent body of men than the rural sanitary authority of that district, and to say that those gentlemen had no interest whatever in the town of East Deerham was quite beyond the mark. Some of them were located in the immediate neighbourhood, and had property within the precincts of the town, and were just as much interested in the welfare of the town as any member of a little local board could be who set up for self-government. It had been said that the works for the disposal of the sewage of that place were going to cost £30,000. He (Mr. Baldwin Latham) would say that it was perfectly untrue, and that no such sum had ever been asked or been sanctioned by the Local Government Board. Just half that amount had been sanctioned by the Local Government Board for the complete works for the drainage, sewage disposal, and water supply of the district, which estimate included all expenses connected with the works; and for a person to come to that meeting, and make the meeting believe that £30,000 was going to be spent simply upon a sewage irrigation scheme, was by no means justifiable. The sanitary history of that particular town was one which showed that there needed to be an amendment of the law, in order that the poor of the district might be protected against themselves. In this little town of East Deerham, a large plot of land was lying in a beautiful situation, which could be commanded for the sewage of the town by gravitation, but it belonged to certain poor people, who had a right to turn out cattle upon it. In looking at that district, it appeared to him (Mr. Baldwin Latham) that it would be for the welfare of the people if he put the sewage of the town upon that piece of land in order to improve its value, and hand it back to them in its improved form, after the money expended and the sewage had been put upon it, so that the people, who had the right of user, would reap the advantage of any improvement, for at present the land was a miserable swamp and bog. But what happened? Why, the piece of land was guarded night and day, month after month, in order that the engineers should not survey it. Those who guarded it little thought that the engineers could survey the land all round, and so get a correct plan of that particular spot in spite of the guard. Then the people who guarded it thought that the engineers would never be so irreligious as to go and take levels on a Sunday, and so they neglected to watch the land on Sunday, and the engineers were able to complete their sections of the work. That only showed the enormous amount of opposition which was met with in the lower strata of society in that particular town to sanitary improvement. It further showed the difficulties which sanitary authorities who were intent upon doing their duty had to contend with. He could tell them distinctly that the local board of East Dereham had been got up simply for the purpose of scotching sanitary progress and sanitary works. It only showed how great a necessity existed for control. The Local Government Board was extremely lenient with towns which were intent and earnest in doing sanitary work, and allowed them all the latitude which was possible. And even in this case they had said to the town in question, we will give you an opportunity of carrying out any sanitary improvements you like, but mind you must do it; you are not formed for the purpose of obstruction. But obstruction was really the object for which this local board had been formed. Then, with regard to the remuneration of the engineer, which had been referred to, he (Mr. Baldwin Latham) might say that up to the present time his account had never been settled. This was exactly the difficulty that he was in. An order had been made by the Local Government Board, and the rural sanitary authority had handed over all the money and plans to the urban sanitary authority. But the urban sanitary authority said, "The rural authority had no right whatever to incur this responsibility. We did not engage you, and we leave you to get your money the best way you can."

Mr. Freeman asked to be allowed to say a word or two in explanation. Mr. Latham had told them that up to that time he had not been paid his charges for survey and plans. But the fact was, that he had been paid over £700 for his scheme of drainage of the town of East Deveham. The amount which was not paid was £127, which he had further charged for having, without authority to do so, engaged Professor Ansted to make a geological survey of the district It was not fair to make a statement of the kind which Mr. Latham had put before that assembly, as to his not having been paid. What remained unpaid was a disputed account. It was equally untrue that the local board of the town were now impeding sanitary improvements. They were devoting themselves most earnestly to sanitary improvements, and the statement which had been made in that respect should be estimated with Mr. Latham's previous assertion as to his charges.

A paper on "The Necessity for Legislation empowering Urban Sanitary Authorities to prevent the proprietors of houses, erected before the constitution of Local Boards, from building upon the whole of the open space belonging to such houses," was read by H. J. Yeld, M.D., F.C.S., Medical Officer of Health, Sunderland.

Dr. Syson said they were all agreed that there was some further legislation required, but he thought that they had hardly considered whether enough had been done with the legislation which they had already had. He thought it would not be hard to bring out from the experience of the gentlemen present plenty of facts to prove that the Local Government Board itself was hardly as well organised as it might be, or marshalled its forces as well as it might do. With its present powers a great deal more might be done. Then there was the muddling up of different kinds of work. He had the greatest respect for the officers of the Local Government Board personally, but he had no respect for the system under which they worked. They muddled up Poor-law work with public health work, instead of having different departments for the Poor-law work, and the medical work. There ought to be a seperate department for medical work with a proper balance of medical advisers, legal advisers, chemical advisers, and so on. He would recommend—to put it straight—that there should be a Minister of Health. The Poor-law people were already overcrowded with work. Then, again, the country was spending a great deal of money over sanitary work with confessedly very little effect and they were frittering their money away. In a district properly mapped out and apportioned, one man could do the work which three or four were now doing. For instance the office of inspector and medical officer of health might be combined with that of the vaccination inspector. Of course there was not time at that meeting to go into details, but those who were behind the scenes knew that three men were being employed to do the work of one. Then, again, those who were on the medical staff felt that they

were, to a certain extent, at the mercy of the Local Government Board inspectors, who might be wise men or who might be unwise. Where there was a wise inspector things would go well, but where there was an unwise inspector both Poor-law and other things would go on very badly. Then, further, some persons expected too much from the Local Government Board. They would never get a Local Government Board who would say to a town when it was in a difficulty, "Oh, here are the plans, and this the way out of it;" but on the other hand, he thought that the Local Government Board should be a little kinder mother to certain authorities than she was at present, and should do something to assist them. It would never do for the local boards to be architects and engineers. On the other hand, they ought to avoid a dictatorial tone, and give friendly assistance wherever they could, and lead and teach. It was universally admitted at that Conference that, if a local board sought advice from the Local Government Board, the latter generally declined to give it, and when it was given it was not given in the plainest and clearest language possible. For his own part, he thought that the legislation which was required was very simple indeed. He was rather in favour of permissive legislation, for he thought that they must learn to walk before they ran, and he certainly thought that they ought to put their shoulders to the wheel, and ask gentlemen occupying the position of the worthy chairman to help them in pushing, and they ought to see whether the first step, after all, was not a thorough organisation at Whitehall. If they re-organised Whitehall, the work at such Conferences as the present would be much more simply and much better done, and the public would get their money's worth for the money which they spent on sanitary administration.

Mr. Edwin Chadwick—We heard yesterday strong denunciations of the defective working of the Local Government Board, and declarations that it "stank in the nostrils" of the local administrations from one end of the country to the other, and these declarations were loudly cheered in the Congress. To-day we have just heard the declaration made that there is hardly a worse piece of administration "outside of Turkey," and particular instances of defective administration, adduced by the learned gentleman who has moved resolutions, and supported by Sir Henry Cole. Now, charges of such a character ought notto be made by gentlemen of such position, and by members of this Conference, unless they are prepared publicly to support them. A competent inquiry into the grounds of complaint may, I conceive, be made the means of important amendment. It is fair to expect that a department charged with large, new, and extraordinary functions may have defects in its working that may well call for revision of a friendly character. One loud complaint that has been made is as to the delay and the unsatisfactory quality of its correspondence with the local authorities. Now, knowing as I do the chief officers there, I am very confident that they will be found to be as hard working men as any that are to be found in any department of the Government. It may, and probably will, turn out that the default is not with them, but arises from the want of a due allowance of force for the work by the Treasury, where there is a great aptitude for economising the means of economy. Of the functions of a central Board to which the right hon. the chairman has adverted, he has omitted one fundamental one, which is this, that it is to be regarded as an agency for the collection and communication to each local authority, for its service and guidance, the principles deduced from the experience of all other places from which information may be obtained. Its enunciations should be, not the mere off-hand rescripts of any one officer, but the well observed experience of all officers within the entire administrative area; and the wider the area of the observation the more complete and valuable are the results obtainable for the guidance of particular administrations. Had the proper exercise of this function which was once commenced, been continued and duly advanced, as it should have been, with extending experience, I can undertake to show that the greater part, indeed, all the material questions, raised at this Conference would not have existed;—the mere gropings in the dark of inexperience, and the confined views of narrow administrative areas and expensive quackeries, would have been prevented. I may give instances of large defaults in this respect, and in the duty of a central authority, as an independent and impartial authority, to see for the protection of ratepayers, and of absentees, that outlays for charges distributed over periods of time, are of a nature to endure, and to be of benefit to absentees, and to reimbursement in the future—equivalent to the charges imposed upon them. It may be that this default is due also to the want of force; or it may be due with other defaults to the want of method, which is to be amended on revision; but I entertain a confident opinion, that from the highest to the lowest of the department, it will not be found to be for want of industry. On the part of local authorities, there are also large complaints alleged in respect to the other great branch of administration with which the department is charged, namely, the regulation of the relief of the destitute. In the early course of the administration of that branch, a Parliamentary inquiry into the complaints preferred against the conduct of the Board was granted, with the result of vindicating and strengthening the central authority. Subsequently, there was an inquiry by a committee, which ended in the condemnation of the Board, inasmuch, as their decisions were not in accordance with the law which they were bound to administer. Instead of a change of persons, and the appointment of others more competent, unfortunately, the change was made of functions by the abrogation of the real Board, and the substitution for the responsible undivided attention of specialists, the rule of the divided and distracted attentions of changing party political chiefs of no special aptitudes whatsoever. The consequences of this in the deterioration of the adminstration of those other branches of administration (which are not now in question at this Congress), have been large and disastrous. Under the amended law, as first fairly administered, the effect was to consolidate and greatly to improve the local administration, with an agency of paid local officers, and to reduce the burthens of the local ratepayers by one half the amount they had previously been. Altered consequences have been brought about, under successive administrations of men, some of them of distinguished ability, but of no special aptitude for the purpose required. The principles of amendment, originally promoted under the Poor-law Amendment Act and demonstrated, in early though imperfect action of partially informed Commissioners, have been amply vindicated recently by petitions from the Chambers of Agriculture, and also from the Boards of Guardians throughout the country, who pray that a return should be made to those same principles of the law as laid down in 1834. But to do this, return must be made to the principles of responsible executive action on undivided attention then provided. In that branch of administration the existing conditions can only be maintained at continued excessive cost of between two and three millions annually. Efficiency of administration, as a rule, is as the undivided competent attention ensured to it. But the existing official conditions, of the results of which we have here heard complaints, will be found to be such as must frustrate the application of the greatest experience and special aptitude. To that I may testify. I may accept the compliments paid to me in this Congress, as having the most full knowledge of the subject matters of administration in question, derived from prolonged attention to wide fields of observation; and this I can say that if I were a member of Parliament, and if I had to be also a member of the Government, and the high honour of being a cabinet minister, we could scarcely have had

thence to attend cabinet councils, and committees, on other difficult and disparate subjects by day, and the discussions on party and other questions in Parliament by night, the application of the best special aptitudes I may have, would perforce be frustrated, and I must inevitably leave the most important work to the desperate efforts of a secretary, who again must leave it to clerks, where it is notorious it now is and must be;—with clerks who are frequently ill requited for such duties as they have to perform. And if this be so, with the one branch of the administration (which is not here under consideration), what may be expected with heaped up functions, such as have been here in question? I entertain a confident opinion that the defaults complained of will be found, as I have stated, to be not with the persons collectively, but from the default of the executive principles of arrangement, which call for examination. Administrative machinery, like other machinery, should have periodic friendly revisions. The local outscreams against centralisation, I have generally found to be the outscream of jobbers, whom its action frustrates. I do not say that it is so here in any degree. A declaratory resolution should, however, follow the strong declarations made, and I offer one, as an amendment to the string of resolutions proposed:—"That the Congress is of opinion that there are large defaults in the action of the central authority which ought to be the subject of Parliamentary inquiry." I expect greater readiness in the complaints of defaults than of preparation on the parts of those who make them, at present at least, to support them by proposals of remedies. We shall see how this may be here.

Dr. Vacher said that he should like to say a word in support of what had been said by his friend, Dr. Syson, and also with reference to what had been said by Dr. Child, as to the great disadvantage of having to deal with clashing authorities. He considered himself competent to speak, inasmuch as he lived in a district where there were not two authorities, but three. They had the ordinary sanitary authority, and they had the parish authority, and they had the port sanitary authority, and, under these circumstances, when a vessel bringing a patient with small-pox happened to put into their docks, and the patient, or those who were responsible for him, were unwilling to pay maintenance charges, it was really difficult to find out to what authority he belonged. In the first instance the relieving officer was generally applied to, and the answer of the relieving officer was, "Oh, we managed these things very nicely some time since, but now a new authority has been created, and you, as representing them, had better manage the best way you can." In a case of this kind they used to put the man in the workhouse wards, but now the workhouse authorities said, "We do not feel disposed to have anyone not in the position of a pauper." And then the appeal was made to the port sanitary authority of Birkenhead, which happened to have its office in Liverpool, and it was very difficult to find out who was the proper officer to apply to. The answer from the port sanitary authority was, "Make whatever provision you think necessary, and then send in your bills to this office, and if we do not think them excessive, we will countersign them." And so when a case of infectious disease came into port, the officers did not know how to deal with it, and sometimes the patient was left on board ship for twenty-four hours or more. In other cases, those in which the patients were derived not from the port, but from the town, it was difficult to know to which authority they belonged. The sanitary authority of the town to which he referred had provided a hospital for infectious cases, and they were perfectly willing to provide accommodation gratis, but they felt that if they did that the guardians would cease to receive even pauper cases, and leave the sanitary authority to provide for them. Therefore, it was necessary to put a sort of protective fee upon the hospital, and nobody was permitted to be taken into the hospital whose friends would not agree to pay maintenance charges to the extent of 14s. a week. It occasionally happened that the patient or his friends were unable to pay 14s. a week maintenance charges. For instance, some time since small-pox broke out in the house of a shoemaker, and three of his children in succession were seized with the disease. He was earning only 35s. a week, and, therefore, he was not in the position of a pauper, but the three children could not be provided for, because the relieving officer said that he would have nothing to do with them, and the sanitary authority had no provision for cases for which 14s. a week could not be paid for maintenance. Thus, in these cases it very often happened that the clashing of authorities prevented patients from being properly housed and accommodated, although there were hospitals in the district professing to accommodate such patients.

Mr. Marshall said that he had waited patiently in order that some gentleman of the medical profession might refer to one point which, it seemed to him, had not been sufficiently considered that day. He could not say that it had not been noticed, for it was mentioned by one medical gentleman who had addressed them that afternoon. It was as to the giving notice of the existance of infectious disease to the medical officer of health. That medical gentleman suggested that the occupant of the house should be bound to give notice. But how was the occupier of the house to know what was an infectious disease and what was not? Their object was that the earliest possible notice should be given to the medical officer of health of the outbreak of a contagious disease, and the experienced eye of that officer, or of the medical man, would detect the disease long before the tenant was able to discover it. Why should not the duties be imposed upon the medical attendant? He thoroughly appreciated the difficulty which the medical profession at the present time had in going to tell tales out of school, so to speak, by informing the medical officer of health that there was a contagious disease in some gentleman's or some poor man's house. The medical men said—and he believed that was the feeling of most of them—"Make it compulsory on us to give the information. Make it a duty which we owe to the state, and we will do it." At present one would tell and another would not, and the consequence was that medical men got into disgrace. The only way to bring the information to the medical officer of health was to impose the duty upon the medical attendant. He (Mr. Marshall) did not think that sufficient notice had been taken that day of the difficulty of isolating a case of contagious disease when it was discovered. They must do one of two things—either keep the patient in the house, and empty the house of other people, or take away the patient. That fact seemed to be not sufficiently attended to. The gentlemen assembled were supposed to be persons who stood, so to speak, in the front rank of sanitary progress, and they had no doubt as to the means which should be carried into effect, and which, perhaps 50 years hence, all the community would agree to; but in legislating on matters of this kind, unless they could carry the community with them to a very great extent, they would find impediments in their way rather than find that they were assisted in their work. If they legislated in the direction of public opinion, they would have public opinion with them, but if they proceeded to go beyond a certain point, they would have the very community which they sought to benefit taking the position of obstructives to them in every direction. The point to be considered in any further legislation on this subject was, how to hit the happy mean—how so to promote the object that they all had at heart so as not in the long run really to retard the improvement which they hoped to see effected. He agreed with the speaker who said that they must look rather to the education of the people, and indoctrinate them into true sanitary science, and then they would not have

such an exceptional case as they had there yesterday, of one gentleman denouncing them all as quacks and impostors.

Capt. Douglas Galton C.B., F.R.S., said that he rose to say one word with reference to the motion which his friend, Mr. Chadwick, had proposed. He did not know whether that motion had been seconded, but he thought that it would be inexpedient to pass such a resolution. But the fact was, that it was very difficult to have inquiries of that sort conducted by a Parliamentary Committee without a great organisation to collect evidence, and without considerable expense. And, in fact, those who would come forward to help the inquiry must put themselves in a position of considerable antagonism to the Local Government Board, and this he thought would be a very undesirable thing. But he thought that all the arguments which had been adduced with respect to the Local Government Board pointed chiefly to defects in its internal arrangements, which might probably be met by themselves, but he thought that they also pointed very strongly to the view taken by Mr. Cresswell in his paper, that the Board should be decentralised, that is to say, that they should, so far as possible, remove from that Board everything to which could be given a local character, and reserve to the Board the duty of generally supervising the local administrations. He thought, as Mr. Cresswell put it, the new county financial board should be able to do the work of local supervision, not only sanctioning loans, but granting them out of local funds contributed within the district. He was sure that, if that were so, they would have a much greater security, that the money would be well spent, and they would ensure that those engineers who were employed would be looked after in the best manner. He did not share the belief that engineers endeavoured always to live upon the community that employed them. He believed them to be most anxious always to do their duty to their clients; but there was no doubt that with them, as well as everybody else, it would be very much better that they should be looked after in the work they did.

Mr. North, Medical Officer of Health, said that he should like to say something on the principle involved in the question before the meeting, which seemed to him to be whether it was desirable at the present moment to call for more compulsory powers from the Legislature than were at present enjoyed. If he understood the tone of the speakers who had advocated that proposition, it was that they thought they would at the same time secure some diminution of central authority. It seemed to him that if their compulsory powers were increased, that increase would of necessity have a contrary effect, and increase rather than diminish the power of some central authority, because if local boards at the present moment would not go beyond the opinion of those who elected them, it would not be likely that they would be induced to do so simply by the insertion of compulsory clauses in an Act of Parliament; and it would be all the more necessary that there should be some central body to make them do their duty. He thought the result would be that the central authority would be greatly increased in power, and that the end which was aimed at, viz., decentralisation, would not be attained. He spoke with the experience which he had derived from being a good many years a member of a corporation, and he thought that their compulsory powers were in many points sufficient at present. If they increased them more than they were now, the only result would be that corporations and local authorities would, by the necessary enterprise of the central authority, be, to a very large extent, shorn of that freedom of action which he thought was necessary. The principle of all local government was that ratepayers should elect their representatives, and no legislation could carry them beyond the state of opinion of those who elected them. If large constituencies, numbering hundreds of thousands, were not able to rise to the standard of what sanitary science required, all they could do was to wait patiently, and hope that in time they would be educated to a better appreciation of what was required. He did not think that any alteration of the law was necessary, and he believed that existing legislation was sufficient to bring about a large amount of good throughout the country. The people were becoming, month by month, and week by week, more largely informed as to sanitary questions and requirements. He would say in this matter, as in others, "Rome was not built in a day," and the generation that came after them would reap the reward of the legislation and labours of the present.

The Chairman—Now, gentlemen, an extremely difficult task devolves upon me, which it is really impossible for me to perform as effectually as I should desire; and that is, to endeavour to sum up, as far as I am able to do so, the discussions which have taken place, at any rate, to-day. Now, that is an extremely difficult task, because the subject itself is extremely wide and complex, and because the discussion of that subject has been wide, comprehensive, and even in some respects occasionally discursive; all that I can do, is this, to endeavour to draw your attention to those points which I think first in order of importance and saliency, and to be content to leave many minor matters, many valuable suggestions of amendment which have been made, somewhat in the background and in the shade. I would say, in the first place, with reference to the specific amendments of law which have been proposed, without dwelling further upon them, that the Public Health Consolidation Act of 1875 has this merit, that it divides the subject matter, which is really local government, into various chapters under various heads. It is called the Public Health Act, but it really is a Local Government Act. It divides that subject matter into a series of parts, and this is a very convenient division, and was intended as a convenient arrangement, with a view to future amending legislation, so that any private member may know how to deal with the matter, and may understand that if he wants to carry out, or propose to Parliament to carry out, a certain amendment in the law, he has only to look for that part of the Act of 1875 which contains the subject matter upon which he desires to legislate, and he need not look beyond the four corners of that part of the Act. It is not necessary that he should make himself exhaustively, and critically, and legally familiar with every other part, and with every other section of the Act. I think it is fair to say this with reference to the construction of that Act. I should add that the difficulties of legislation are of two kinds. There is first of all the difficulty of knowing what amendments to propose, but there is, secondly, the difficulty both for Government and for private members of carrying legislation through the House of Commons, and that is a very rapidly increasing difficulty. As to private members it is almost an impossibility. But you will tell me, perhaps, that Mr. Alexander Brown has had the good fortune to carry through the House of Commons, at any rate, the Public Health Act Amendment Bill of this year. That is true, but that was not the Act of Mr. Alexander Brown alone. It was effected because the department of the Local Government Board was willing to be assisted by Mr. Alexander Brown, and to assist him in passing that Bill, and it is only by that kind of common consent that that Bill has passed the House of Commons, and without that common consent it could not practically in point of time have been carried, so that we must, to a certain extent, moderate our views and expectations in that respect. Now, that brings me to another and a distinct proposition, very ably argued upon the part of Mr. Alcock. He objected to bye-laws upon many grounds, which have something in them. He said that after all a question might constantly or frequently arise whether a bye-law was a legal bye-law. I may, perhaps,

say to him, in reply, that questions very frequently arise as to the meaning and interpretation of the section of an Act of Parliament, so that after all that is not a conclusive objection against bye-laws. But one reason in favour of bye-laws is this. Mr. Alcock's suggestion was, that you might have a building Act for the whole country outside the metropolis, and that that could be applied, or partially applied, under the sanction and discretion of the Local Government Board, to the various local areas and authorities in the country. Well, now, I can assure him that it would be almost an impossibility, even for a Government department, to pass in the present state of affairs, and in the present temper of Parliament, an Act of that description, going into all the details of building operations, and that, practically speaking, we have no option with regard to this kind of detailed legislation, but to legislate by deputy; and bye-laws are legislation by deputy. What we have to do, therefore, it appears to me is this. So far as the Public Health Act may have been deficient in conferring powers either on the Local Government Board or on local authorities, then, in the fewest possible words, and in the simplest possible way, amend that Public Health Act, and then, under that amended Act, pass bye-laws for the approval of the Local Government Board, which would be efficient for the purpose for which they are conceived. That a good deal can be done in this respect is, I think, undeniable, from the fact that I have in my hands a series of model bye-laws issued by the Local Government Board. It may be fairly assumed that these model bye-laws, with perhaps some exceptions, would stand legal criticism in courts of law. And here you have a series of model bye-laws which deal with almost every subject of local government. You have the first on the cleansing of footways and pavements, the removal of house refuse, the cleansing of earth-closets, privies, ashpits, and cesspools. Then you have others. I will not stay to enumerate what they are, but I think there are six or seven of them, and they practically exhaust the subject matters of local government administration. I think I may make a good practical suggestion; I would make it to Mr. Alcock and other members attending this Conference; I would suggest to them to take this bundle of model bye-laws, and when we meet again next year be prepared with specific written statements of the deficiencies of those bye-laws, and of the way in which those bye-laws ought to be amended, and also of whether additional legislation would be required in order to enable local authorities to pass, and the Local Government Board to approve and confirm such amended bye-laws. That, I think, would be a very good practical subject to suggest to many of our practical and scientific men at the meeting next year. Well, then, I would come next to the speech of Dr. Syson; and I come to that next because I shall have to express a decided difference of opinion, and I think I had better express it at the beginning. I will say, before I express it, that I do not believe there is much difference of opinion when we get to the bottom of our ideas, and that I have often found that people imagine wide differences to exist between them, when the real fact is that they have not always sufficiently ascertained the meaning of the terms they use, or the amount of agreement in opinion which possesses their minds. Now, Dr. Syson made a speech with the general tenour and thought of which I think I almost entirely went; but he made one suggestion with which I can not agree, and I will give the reasons why, and I am mistaken if those reasons will not prove satisfactory to Dr. Syson himself. He proposed, as the great necessary and preliminary improvement in imperial administration, that you should separate the imperial supervision of poor-law administration from the imperial supervision of local government administration in the country. That, I think, was Dr. Syson's recommendation. Well, now, that is to say that you should repeal the Act which added the Local Government Office and the Medical Department of the Privy Council to the Poor-law Board, and which transformed the Poor-law Board into the present Local Government Board. Now, that Act was mine; I am responsible for it, and, therefore, it is natural that I should defend its policy. Well, to defend the policy of that Act is really to go into the whole question of organisation, which has been raised mainly by the paper of Mr. Cresswell to-day; and I will endeavour to deal with it in regard to certain propositions of his. But I will say, in the first place, that it could not promote simplicity in organisation, either imperial or local, according to my view, if you were to separate either the local administration or the supervision of that administration of the poor-law from local government administration or law. Now, for instance, in Poor-law administration all the sanitary questions arise which have to be considered in what we call local government administration. You must build your workhouse in accordance with sanitary regulations, and you must deal with your paupers and with your workhouses in accordance with sanitary laws. You cannot have a poor-law administration without that local administration having sanitary and medical functions to fulfil in connection not only with the building or regulation of these establishments, but with the dealing with the diseases of those who are paupers, and who, therefore, come under that local administration. Therefore, I think that it will be quite clear—I go no farther than this at the present moment, but it appears to me to be quite clear—with reference to an ideal organisation in the future, that that cannot be the true and the right idea that would separate those two things which are really part of one thing; that is, the local government of any particular area of the country as a whole. And the idea to which my mind has already tended, and by which it has been governed in any legislative or other proposals that I have been connected with, has been that you should concentrate all the functions of local government, of whatever kind, in one governing body in the largest area for which those functions were fit. That is, I think, the principle which will, in the end, lead to much simpler organisation of administration than any division of those functions. Well, now, I will endeavour to explain those views in a little further detail, and I will commence with the paper of Mr. Cresswell, which made various proposals. The first was, the employment of the ballot in the election of members of local boards; that is to say, of urban and rural sanitary authorities. Well, the subject which is really raised by that proposal of Mr. Cresswell's as it seems to me, is a little wider than the question of the vote by ballot. It seems to me to be the question of the method of constitution, as well as the method of election, of those various local governing bodies. You may have election by ballot, supposing that to be a cure for all the evils to which he has referred; but if you have that election within a very small area, accordingly, to my experience, you are not likely to get a board which you can trust to perform the critical and responsible functions of local government, especially with regard to health. In my view, it is of the greatest importance that you should, as far as you can, enlarge the area of local government, and that you should set your face, as far as possible, against the multiplication of those small areas and small boards, who cannot be trusted to fulfil their public duties. Well, then, if that is the first proposition with regard to the organisation of local administration, the next thing that occurs to one's mind is this: by what further proceeding can we promote the independent character and the public efficiency of such governing bodies, and the next principle which has always occurred to my mind is this—that you should endeavour to interest the best men in every district; for the great practical difficulty in these days is to get the best men in your neighbourhood to undertake public local duties. They are weary of the petty and commonplace functions of ordinary local government, and you

cannot get them to do that work. Well, then, the only way to get them to do it is to ennoble it, and the only way to ennoble it is to enlarge it, and the way to enlarge it is, first of all, to enlarge the area, and then to enlarge the functions, and thus, then, you would enlarge the functions in all ways. Then you would have a fit area, and a competent authority elected by the inhabitants of that area; and I entirely agree with the two last speakers in the view that we can build up nothing which we can trust in the long future which is not built up upon the lines of local self-government. I do not believe in promoting or securing the health of the people *ex cathedra*, or from above; and I consider that the question of health is very largely an educational question. Well, then, one way in which you would, as I say, enlarge and ennoble the functions of boards of this kind, would be to say that, in every local governing area, the local governing body should be the local governing body for all purposes, and then it would come to pass that the details of what we have been accustomed to call sanitary administration would be entrusted to competent and sufficiently-paid officers; and that is the principle adopted by all business men who succeed in business. A man begins to make his fortune by doing everything himself, but after he succeeds, he ends by doing nothing himself, but being simply an organiser of a great machine which goes almost by the touch of his finger. Well, now, we ought to have the same principle in the organisation of the local board. If you enlarge the functions, and give higher functions, you give an inducement to good men to go upon that board. There are some men who do not care for the simple subjects of ordinary town councils, but give them the subject of education to deal with, and I say you will tempt such men to come upon the boards. Therefore, I say, the philosophy of the thing is perfectly clear—that, first of all, you have to get the largest areas that you can and that are fit for particular functions, and then to attribute all those functions, for which you have got a fitting area, to one governing body; then to get at the best mode of election; then to give that governing body as much independence as possible of the imperial authority. Dr. Syson will see that it is a necessary consequence of that general view, as far as I am concerned, that you should not separate poor-law from local government administration in the locality; and, if you do not separate it in the locality, you cannot separate it in the imperial department which is to supervise both of these subject-matters of local administration; and I think that I shall be able to show you, before I sit down, that it is by no means necessary, in order to simplify the proceedings of the Local Government Board, that you should subdivide, but that, on the other hand, to subdivide it would be to increase its complexity; and it is by no means impossible so to organise its business that it may be conducted, as a great business ought to be conducted, simply, efficiently, and without loss of time. Well, then, perhaps the next subject in one's road of thought is this. We have got these units of local administration, as I may call them, as large as we can; but there are certain functions for which those areas are not sufficiently large, and then you must create larger areas for those special functions, and then we come naturally to the question of the creation of county boards. We are brought, without reference, to further questions, naturally and directly to the notion of the creation of a county board. Now, county boards have been advocated to-day from several points of view. First of all, there is the fact that there are certain functions of local government which could hardly be efficiently exercised on smaller areas. You have the management of roads, and you have the conservancy, and the prevention of the pollution of rivers. Now, I think I said, in my opening remarks, or at some period in the course of the discussion of yesterday, that I had supported or approved of the passing of the Rivers Pollution Bill, because it established legislatively the proposition that the pollution of rivers was to be prevented. It provided the method of that prevention; but if that method of prevention did not succeed, the case would be complete for the passing of an Act to improve it. In the great legislative pressure in which we live we often have to consent to that mode of legislation. We get a Bill through making, as it were, confession of a fault, and containing, perhaps, an imperfect remedy, and then you can improve that remedy at some subsequent time. Anyone must have known, on reading the Bill, that it could not work, because the machinery led to such complexity, and seemed contrived ingeniously, to set the whole country by the ears, and to set authority against authority, and riparian owner against riparian owner, up and down the stream, all over the land; so that the end was that clauses had to be inserted forbidding anybody to take advantage of the Act, except with the leave of the Local Government Board; and that is about as complete a confession of the unfitness of the Act for practical purposes as, I think, could be found on the face of any statute. Now, the true solution of that question, according to my impression, is the creation of county boards. I know many scientific men have said that even that would not be a solution — that you must go beyond the county and have watershed authorities, and I do not deny that there is a great deal in that view; but, first of all, you must have the county boards for other purposes. You must have them to complete the structure of the edifice, as it were, and to enable local government to hold its own; and, therefore, having the county boards, I would put upon them the question of preventing the pollution of rivers, and of the conservancy of rivers, as far as they could perform that function. I would give powers to certain county authorities to unite and form watershed authorities, where it might be desirable, with the sanction of the Local Government Board. Well, another point of view raised, I think by Mr. Cresswell, was that the county board should stand between what I may call the unit of local administration or Local Board—in fact, the urban or rural sanitary authority—and the imperial supervising department; and that the county board should take upon itself, or should have allotted to it, a considerable portion of the powers now exercised by the Local Government Board. Now, I am not disposed to express a definite opinion at this moment upon the extent to which that idea might bear fruit in the future. I do not hesitate to say that it is an idea which will bear fruit in the future; but I am not prepared at this moment, and I do not think it desirable at this moment, to say to what extent, because my view of the matter is this. I have expressed it in Parliament, and I will repeat it here. The true way, in constructing organising measures, is to plant an institution in some natural soil, to give it enough to live on and to work for, and to give it time to grow. If we were to get a number of experts together, and say, "Now, draw us up the clauses of a Bill to constitute county boards, and tell us all the functions that those county boards ought to undertake, and let the thing be so perfect that, as far as local government is concerned, it is the millennium brought to our own day," the result would be, first of all, a Bill which you could not pass, and then which you could not work if you did pass it. But what you will do, if you create county boards, is this, you will at once change the centre of gravity of the whole system. Now, in that expression lies the secret of the whole thing. The moment you have created the county board on proper lines, and given it enough to go on with, you may depend upon it that by a force analogous to that which enables larger bodies to attract smaller bodies to them, it will attract to itself many of the functions of smaller governing bodies which are now inefficiently performed, or it will at least attract to itself some sufficient supervision over the performance of those functions. Another good thing it will do in altering the centre of gravity of the system is this: you will have a different

idea in men's minds, and the repute, in fact, of local government will be altered and raised in the public and in the legislative mind, when you have once created and set to work large boards with considerable functions like county boards. You will then have boards which can not be dealt with in the same kind of way in which smaller boards are dealt with. They will know how to hold their own against any governmental body, and there will be a natural tendency on the part of smaller boards in the county to aggregate round them, and to appeal to them for protection and for help. But to enable the scheme of county boards to affect these purposes the scheme must be built up upon the right lines. Now, I approve of the ballot, I approve of direct election by the ratepayers; but what I care about far more than those questions at this moment is the areas upon which you should elect and return the members to county boards. The fault that I find with the Government Bill —and it is a fault that I have found within the House, and I have put down an amendment on the paper to meet it, and I have much support upon the Government side—is this, that they propose that the election should be made upon the area of the petty sessional division, and I propose that the election should be made upon the local government areas within the county. Whether the election be direct, or whether it be an election to the county boards of the various subordinate boards within the county, that is a secondary consideration. If you have the elections taking place upon the fitting areas, you will have a county board which will feel that it represents each administrative area within the county, and you will have all those administrative areas feeling that they are represented on the county board, and the two will be able to come together and coalesce, and to strengthen each other, and to play that part in the revivification and the strengthening and consolidation of local government, which we desire that they should conjointly play. Well, then, as far as that question is concerned, I have sufficiently explained my view with this exception. I would refer to a remark of Dr. Child, which struck me as very appropriate. He talked about the confusion of authorities; I did not at first catch where the confusion of authorities was, but he gave an illustration, and certainly it has thrown to me a somewhat new and additional light upon the question. He says that within a particular area, while you may have only one sanitary authority, you may have three or four, or five judicial and interpreting authorities, and that there is very great mischief. You may have one law, you may have one compilation of bye-laws, to administer over a particular and a large area—a union, for instance, or a rural sanitary district to which those laws are applied. But, if that area happens to be situated within three or four different counties, those laws will be interpreted by three or four different benches of magistrates; that is to say, by three or four different magistrates' clerks, and there is a confusion of authority which certainly had not occurred to me before, and that is an addition to our information upon this subject which we have got from Dr. Child today. Therefore, for all reasons, we want simplification of areas, and that is another merit which the constitution of county boards possesses, that the moment you constitute a county board it will dominate the whole question, and every one will feel that every area must be brought within the area of that county board, and that all crossing of areas must be avoided. And when you come to that, you will have attained the simplicity which is so necessary for the purpose of good local government. Of course when you do that, there are various things which will have to be carried out. I will take two cases. I will take, first of all, the question of highways. Well, you must know that highway areas differ from the sanitary areas. This is folly—it really is foolishness—to persons accustomed to study this state of things. It may do for the time, but it will not do in the long run. The local sanitary authority, whatever it is, ruling a particular area, must rule that area for all local government purposes, unless it is for purposes for which that area is too small, and then the simple principle which you have to bear in mind is, that there should be a multiplication of those various areas without the crossing any two of them. Then the other legislation that I would add is legislation with regard to the Poor-law. Now when I framed the Public Health Bill, and constructed those sanitary measures, my mind went further than the clauses of that Bill, because one cannot always put into a Bill everything which one has in one's mind, or looks forward to in the future. I had then this principle in my mind of the simplicity of local administration, all functions, if possible, in the future in one governing body in one local area; and if you will consider the thing for a moment, you will find that, complicated as it appears, it would be the simplest possible process, at some future time, to effect that simplification, as far as the Poor-law is concerned. There is no reason why the Poor-law administration in localities should be severed from other local government administrations. There are many local government areas far too small for many parts of the Poor-law administration. For instance, for the management of a workhouse, many local areas are too small; but as soon as you have the local government area too small for a particular Poor-law function, all you have to do is to construct a body ruling over a combination of those areas for the performance of those functions. And, to give a further illustration, you may do it in this way. It is perfectly conceivable, in order to complete that idea of simplicity of organisations, that you might have out-relief managed within your local government areas as they exist, and that you might have in-door relief managed by the present unions, or even by the county at large. Those things are perfectly conceivable. It is not necessary that you should come to any opinion upon them now; but as soon as you have adopted that principle in your organisation of areas, that there is to be no crossing of areas, and that you have all local government functions which are fitted for a particular area imposed upon one governing body in your area, and that you admit of no larger area with local government functions which is not simply a multiplication of those units, then you have got an arrangement which enables you to meet any present or future exigencies with regard to the execution of those functions, and without the possibility of confusion. Well now, I will say a few words more. Mr. Cresswell referred, in speaking of imperial administration, to several cases in which local bodies have been informed, as I understand, by the Local Government Board, that they could not be assisted in any methods of getting rid of water-carried sewage, save that of land irrigation. And, on the other hand, our attention was drawn to the report of the committee of the Local Government Board, of which Mr. Rawlinson was himself a member, in which they distinctly admit that land irrigation is not possible in every case, and that there are towns which can not deal with their sewage by that process. Well, I am not able to reconcile that apparent contradiction, and I think that I ought to say, with reference to some remarks which have been made, and which have been rather strong in their character with regard to the Local Government Board, that all the remarks which are made here ought to be made—and I trust they will in future be made—with the kind of reserve which should arise from the fact that, after all, we only know one side. I am not prepared to say that there is not an answer to this apparent contradiction. I am not prepared to offer an opinion upon the subject; but it is clear to me that no public department ought to take upon itself (if it does do so) to inform local bodies that there is only one method of dealing with their water-carried sewage, which is acceptable, or admissible or permissible, and that is by land irrigation and filtration. Now, I should like to say a word upon the Local Government Board itself. First of all, I may

say that, like our other great departments of the State, it is admirably served. Now there is no question about that. What I shall say to you upon that subject I shall say with the most complete candour, and I shall tell you exactly what I think. It is admirably served. There is no department better served. You have men fit for all work which you want them to do. The question in my mind is not the fitness of the men, but the organisation of the department. It is admirably served. I am not prepared to say that the deficiencies in its policy of organisation and of administration are consequences of its not having had enough money given to it, or enough power conferred upon it by law. But I am prepared to say that, without adding another clerk to the establishment, and without giving the Board any additional power by an Act of Parliament, a very considerable change for the better may be made in the policy of its administration. The remarks upon that head which I shall make are not new, as far as I am concerned. They will be expressive of opinions which I have entertained since I was President of that Board, and which, as far as time permitted, I put in force when I was president. Now, to go to the bottom of the matter. In my mind it is that there is a tendency in all Government departments to become merely secretarial departments. That is to say, they do not understand that they are administrators, and that they have to drive their work; but they do understand that they are secretaries, and that they have to answer the letters which come to them to be answered. Now, that is really almost the secret of the whole thing. They are full of distrust of what I call administration. They do the very reverse of what a successful man of business does. A successful man of business begins by doing everything himself. As he goes on and enlarges, he organises his business. He subdivides it into branches. He chooses his men, and if a man does not suit him he gets rid of him. I know that it is not easy for a Government department to do that. I have to make that allowance. But when a man of business has got a man who suits him he trusts that man. Now, that is precisely what a Government department hardly ever does. It is what a Government department of this administrative character ought to do, and, in my opinion, could safely do. It is a question of organisation. It is a question of the administration of a business. But, as Mr. Chadwick told us to-day, and quite rightly, a politician going in at the head of that Board, however practical his views of administration might be, has not the leisure whilst he is there, and in all probability he will not be there long enough to do what has to be done. And now I will put before you my first suggestion, and it shall be of an extremely practical and telling nature. The very first thing I would do is this. I would here ask myself "Who is the permanent head of the department? What is he called, and how is his business managed?" Looking in that way, I should find that the permanent head of that department was a secretary; I should say that will not do. I should say what I said when I was there. The permanent head of the department has no right ever to have a pen in his hand. He ought to do like Count Moltke was said to be doing at the beginning of the German war—walking about his office with his hands in his pockets and whistling. The head of the department ought to be an organiser. He ought to rule policy. He ought to see men, and he ought never to put his pen to paper. Now, it is impossible for me to speak too highly of the abilities or of the labours of the men who gather around that extremely able public servant, Mr. Lambert, of the Local Government Board. But when I go there, as I do occasionally, to consult with him, I feel a delicacy in entering his room; and though I do not waste his time, because I am sufficiently familar with these subjects to go direct to them, yet I feel that every moment that I take of his time is more than he can afford, because, with regard to him and some of his ablest assistants, I may say that if you go into their rooms you can hardly see them for the papers that surround them. That is unsound, and what is the result of it? Why this is the result of it, and I found it so when I first went. You have always an arrear of papers. You have a dead weight of papers. You let your work drive you instead of driving your work. You get an accumulation of papers. You sit with them up to the top of your head, and you are constantly striving in vain to get down your work. You are constantly behind your time, and it is a well known fact that delays are increasing in the Local Government Board, and that, in spite of the merits of the men who serve it, and I was going to say in spite of the enormity of their labours, they cannot keep up with their work, and they cannot prevent causing dissatisfaction in the country. Well, there is nothing but organisation that can get over that, and the first step of that organisation is that the permanent head of the department shall not be a secretary. He should be a manager. Call him, if you like, the permanent Vice-President of the Board. I do not care at all about names, I want the thing. I want the man who shall administer, and who shall leave to others the duty of recording on paper the conclusions at which he and his subordinate administrators arrive. Well now, if you had such a man, how would he naturally set to work. Well, it is a very complex subject, and it must be a very complex machine which such a man will have to supervise. He has to deal with poor-law questions, with legal questions, with engineering questions, and with medical and chemical questions. Why, such a man would gather around him the heads of those various departments, and he would consult with them upon the general policy of administration, and he would create, and he would secure, the permanence and the continuity of that policy of administration. Then, how would you carry it out? Supposing you conceive your policy of administration—your policy of business—to pursue my analogy of business—how would you carry it out? I will come to the secretaries, but I would not think of them, even in the second instance. I would, in the second instance, think of my local representatives, that is to say, the inspectors of the board. You have general inspectors for what you may call legal purposes. You have medical inspectors and engineering inspectors, and what you want with regard to these foreign representatives of yours—your ambassadors, so to say, to the powers in the country, the local authorities with whom you have to deal—is this, you want to organise the relations of those various classes of inspectors in such a way that, just as we have proposed that there should be no clashing of areas of local authorities, so there should be no clashing of imperial departmental supervision, and then you will get that simplicity of imperial administration which I have always stated is required in local government in the country. Supposing that to be done, do you not think that one important result would be this, that you would immediately, at the Local Government Board, find an immense diminution of that amazing and unprofitable paper correspondence which they carry on? I would do nothing by a letter which I could do by a man. But precisely the contrary principle obtains, and is believed in by local departments, because it is the tradition of all those departments. Their tradition is a fearful tradition. They fear responsibility, and they write lawyers' letters, conveying no information and putting other people in the wrong. What they ought to do, as has been said to-day, is to nurse, to back up, to encourage, to inform, to help. While I was there I had one little scheme of my own. I mentioned it before. I think it would have been a very good one. Little things sometimes go a great way, for they tell a tale. I had no room to do what I wanted, or I would have done it. I wanted to constitute an inquiry department. Now, you have men in the Local Government Board who are extremely willing to give information, simply

because they are good public servants and good men but I would have in that office a department devoted to the subject of affording information to the public who inquire; and I think the result of creating such a sub-department would be extremely advantageous upon the whole spirit of the administration of the Board itself, and upon the spirit of the public, and the confidence of local authorities wanting information and applying for it. I think that it would be understood to be a step in the right direction, and a hand held out to those who ought to be helped by the department created for the very purpose of helping and strengthening local bodies in the execution of their duties. Well, as far as I can recollect, I have now about exhausted that subject, and I hope I have made myself tolerably clear. There are many other questions upon which I could go back—questions, for instance, which were discussed yesterday and this morning; but if I interpret your minds and views rightly, I think you would wish that we should close this Conference with the remarks that I have endeavoured to make upon the discussion that has occupied the latter part of our time, as after all it is the biggest subject. It is the subject of the true solution of all those questions, and I do not think that there is any subject so profitable or so interesting, on the whole, for your consideration and for your conclusions. Now we have before us a proposed amendment by Mr. Chadwick, and I think we had a proposal from Mr. Cresswell in favour of the constitution of county boards. I am not sure whether Mr. Cresswell put that forward as a motion or resolution, which he proposed to pass.

Mr. Cresswell—I said, Mr. President, that I hoped that this Conference would not separate until they had recorded by a resolution in general terms, their desire that you would be the interpreter of their feelings, both in Parliament and out of it, in conjunction with the Council.

The Chairman—I will take that as a motion. I do not know whether I am to take Mr. Chadwick's as an amendment upon that motion.

Mr. Chadwick—I intended to put it as an original resolution, but as my friend, Sir Henry Cole, does not seem disposed to meet the challenge that I have given that those gentlemen I referred to could sustain their allegations with respect to the Local Government Board, I am ready to withdraw the motion, but will leave the matter with them.

Sir Henry Cole—I confess myself in rather a fog. Mr. Chadwick let off a gun, and asked me whether I seconded it. I had not considered it. He proposed a Parliamentary inquiry into the Local Government Board. I do not agree with that, and I agree in the objections that were made to that mode of proceeding. I much more agree in the Chairman's essay upon local government administration than upon an off-hand resolution of that kind. But you know that Mr. Chadwick does do things in that way. I am very sorry I could not answer at the instant. It was "stand and deliver."

Mr. Chadwick withdrew his amendment, as it was evident that the complainants were not ready to sustain their complaints without further consideration; as, indeed, proceeding upon them here would be sectional, and they might form part of a larger suspending inquiry pressed on other grounds from other quarters.

The Chairman—Well, then, I think that Mr. Cresswell is going to propose a resolution, and I think that if it meets your views, you cannot do better than conclude by passing the resolution which he is going to propose.

Mr. Cresswell—Then, gentlemen, the resolution I beg to propose, as a practical conclusion of this Conference, is to the following effect:—"That this Conference desires to record its opinion that further legislation is needed, especially with regard to the constitution of county boards, with a view to strengthen the Local Government administration, and authorise the Chairman in conjunction with the Council of this Society, to be the exponent of its views on this subject, and to lay the subject before her Majesty's Government in such manner as he and the Council may deem most expedient."

Capt. Galton—I beg leave to second this resolution.

The resolution was carried unanimously.

The Chairman—Here is a resolution brought forward by Mr. Robinson and Mr. Shoolbred. Had it been possible to ask for your attention to a new subject, it would have been very worth to discuss it, but I think that it is hardly practicable at this time of day, and I think that it must be deferred.

Dr. Syson—I may take this opportunity to propose that we should thank our Chairman for the able and efficient manner in which he has conducted our proceedings. If we had only had that summing-up, that of itself would be sufficient to bring us here. I consider that summing-up worthy of the whole four days' labour. I wish we could send politics beyond Turkey, and put our Chairman as a permanent administrator, at least for our time, of the poor-law and sanitary administration of the country. I think that peculiar thanks are due to him for the very able way in which he has guided us, and for the admirable summing-up of our opinions in his closing remarks.

Mr. Chadwick, in supporting the vote of thanks to the Chairman, stated that it was satisfactory to observe that the right hon. gentleman must, in these discussions, have learned much for his future guidance in legislation, and for safe administration, which it was quite impossible he could have learned amidst the turmoil of party conflicts in Parliament during his short tenure of office at the Local Government Board—for the service of which he had much yet to learn, by coming amongst them, that might impart the full special aptitudes required for the administration of the great branches of service there, when, in the fulness of time and the change of parties, he might return to office again. Unhappily, however, in the usual course, if such an event were to happen, it would be that he might be sent to some office, where the appropriate information he had acquired would be of no use whatsoever. Nevertheless, they would be of use for aiding in current legislation.

The motion was submitted by Mr. Chadwick, and carried by loud acclamation.

The Chairman—My only remaining duty is to return my thanks to my friends, Dr. Syson and Mr. Chadwick, for the extremely kind way in which they proposed the vote of thanks to me. I should add my thanks to Mr. Cresswell for his too flattering allusions, and I must thank you all for the equally flattering attention which you have paid, and for the very kind interpretation which you have placed upon my endeavours to serve you upon this and upon former occasions. I now declare this Congress at an end. I hope that the Society will kindly consider the suggestion which I made at an earlier period, of somewhat enlarging its scope in future years; but in any case I trust that it will be followed up, and be an Annual Conference for many years to come.

PAPERS PREPARED FOR THE USE OF THE CONFERENCE.

THE EXPERIENCE OF ROCHDALE ON THE SECOND AND FOURTH SUBJECT ON THE PROGRAMME OF PROCEEDINGS.

By Alderman Taylor.

I.—*The Second Subject*—"*Gradual Abolition of Cesspools and Middens, and substitution of Tubs and Pails with speedy removal.*"

The collection of excreta and house refuse in pails and tubs has been in operation, in Rochdale, for ten years. The rate of increase in the adoption of the pail, and so the gradual abolition of the cesspools and middens, will be seen by the following figures:—

March 31st,	1870,	there	had	been	adopted	527	pails.
,,	1871,	,,	,,	,,	,,	543	,,
,,	1872,	,,	,,	,,	,,	620	,,
,,	1873,	,,	,,	,,	,,	819	,,
,,	1874,	,,	,,	,,	,,	1,471	,,
,,	1875,	,,	,,	,,	,,	761	,,
,,	1876,	,,	,,	,,	,,	825	,,
,,	1877,	,,	,,	,,	,,	798	,,
,,	1878,	,,	,,	,,	,,	1,140	,,
			Total pails			7,504	

The borough was extended by the Act of Parliament in 1872, and now comprises 4,180 acres—being an extension of 3,004 acres. The district added to the borough rapidly adopted the pail system.

The population in 1872 was 45,224, and now in 1878 is 71,000. On the 25th January last, it was ascertained that there were still 1,200 old prives and middens, when the Health Committee of the Corporation, being fully convinced of the advantages and economy of the pail system, and the absolute necessity that the practice of "tipping" should be abolished, decided to recommend that the whole of the remaining old privies should be altered to the pail, and this, notwithstanding the satisfactory increasing voluntary alterations now being carried on.

The town, for the purpose of collection, isdivided into six districts, named A, B, C, D, E, and F. Notice has recently been served on 80 owners of 163 privies in A division, to alter these to the pail system. Notice will immediately follow in B and the other divisions, and it is hoped that within the year the whole of the old privies will be abolished in the town. It might naturally be expected that considerable resistance would be made by the owners of the property, and in a few cases it may probably be so, but as yet there is a willing acquiescence. This state of mind is, no doubt, in a great measure, brought about by the clear advantages of the pail system; the tenant, the owner, the cottager, and the dwellers in highly rented houses, as also the millowners, are united in their approval, and no power would induce the people of Rochdale to resort to the cesspool, privy, or midden arrangements.

Looking at the heading of this subject, "The Gradual Abolition, &c," after the experience of the alterations of the old privies in Rochdale, one lesson we should draw and recommend, would be if the sanitary authority of any town began a similar work, it should require that the whole alterations should be completed within one year. This requirement might be, to some owners of property, very difficult to comply with, on account of the cost, but, to meet such cases, the authorities should themselves undertake the alterations, and allow the payment to be made by easy instalments.

The time of removal—one week—has not been altered.

II.—*The Fourth Subject*—"*Progress, if any, made in the Utilisation of Excreta since the last Conference.*"

In a paper read at the last Conference, I stated that a machine for drying excreta, according to Mr. Firman's patent, would be erected in Rochdale.

There are now two machines at work, which reduce 14 tons of excreta as collected to 1 ton and 3 cwt. daily, to each ton of excreta there being added 25 lb. of sulphuric acid.

The following is a detailed analysis of the dried product by our chemist, Mr. Thomas Collinge:—

Insoluble silica	2·216
Lime.....	1·310
Oxide of iron and alumina ..	0·667
Sulphuric acid.....	1·885
* Phosphoric acid	3·102
Sulphate of potash	5·586
Chloride of magnesium.....	1·910
Chloride of sodium	5·120
Sulphate of ammonia	22·191
	43·987
† Organic matter	56·013
	100·000

The machines are 13 feet long by 4 feet in diameter.

The time required for drying varies according to the pressure of steam. With 60 lbs. pressure it requires about three hours and a half, and with 20 lb. five hours and a half.

This work is attained by our second machine, in which, though under Mr. Firman's patent, the

* Equal to 6·771 tribasic phosphate of lime made soluble.
† Containing 3·083 nitrogen, equal to 14·534 sulphate of ammonia.

faults of construction of the first machine have been avoided.

The quantity of excreta collected has risen from the average of the year of 124 tons, to 135 tons in the last two months, and we calculate that we shall reach 160 tons in the next 15 months, that is, when the town will be entirely on the pail system.* With four machines, the whole of the excreta may be dealt with, but it may prove to be more economical to have six machines, to allow sufficient time for repairs and for contingencies.

The cost of one machine, with boiler and engine, including patentee's royalty, is about £800; and of two machines, £1,400. After very careful calculation, the saving effected by one machine will be from £16 to £20 per week, or approaching £1,000 per annum, as compared with the cost of selling the excreta in an unmanufactured, or partially manufactured state.

At present the manufacture is carried on in the centre of the town, but the Health Committee has decided to erect a third machine at the southerly side of the town, so that the cost of collection may be reduced. There is another site also contemplated on the northerly side.

Besides the excreta, the treatment and utilisation of the house refuse enters into the question, and requires notice. The average amount collected in the year has been 209 tons per week, and in the last two months 250 tons. We estimate that in fifteen months there will be 280 tons.

The cinders, and all vegetable refuse sifted and separated from the dust, &c., has supplied the requisite fuel for generating steam for driving three steam-engines (having 16 nominal horse-power), and for drying the excreta; but I may here state that if we increase our pressure of steam for drying, a little coal may be required.

The fine dust from the refuse we use for a lower-class manure.

That part of the refuse which is not combustible, or otherwise saleable, such as pots, we grind up with the clinkers from the furnaces of the boilers, for making mortar, the quantity made this year being 914 tons, and a most excellent mortar it makes.

The butcher's and fishmonger's offal is added to the manure, the weight being about 8 tons per week, additional to the excreta and refuse. Thus all our refuse is made use of profitably, and the requirements for a "tip," that disgrace to a town, done away with.

All the manure we make has met with a ready sale, and a great number of offered orders have been obliged to be refused.

The table below shows the yearly progress of the pail system. It may be well to observe that the year is reckoned from April 1st to March 31st. The effect of manufacture and non-manufacture, in increasing or decreasing the cost, is at once seen. In the years 1876 and 1877, there was practically no manufacture, the value under the heading gross receipts being chiefly for the crude mixture of night-soil and ashes. In 1878 the manufacture of manure has again commenced, but not through the entire year.

Year ending March 31st.	No. of closets.	Collected		Manure		Houses.	Mill and workshops	No. of persons using the closets.	Gross expenditure.	Gross receipts.	Net cost.
		Excreta. Tons.	Ashes. Tons.	Made. Tons.	Sold. Tons.				£	£	£
1870	527	398	611	377	217	1,048	12	5,797	694	537	157
1871	1,070	846	1,521	1,059	699	2,944	31	11,770	1,538	1,380	158
1872	1,690	1,431	2,405	1,566	1,019	3,174	39	19,283	2,392	2,167	225
1873	2,509	1,989	3,413	1,989	412	4,560	69	26,984	3,463	2,826	637
1874	3,980	3,516	5,196	3,497	1,543	7,287	106	43,500	5,284	4,449	835
1875	4,741	4,224	7,650	3,741	2,002	8,487	123	50,000	7,057	4,420	2,637
1876	5,566	5,290	8,483	755	2,040	9,433	146	52,000	9,354	860 626	7,868
1877	6,364*	5,643	9,277	410	1,136	10,443	162	54,500	13,407	771	12,635
1878	7,504*	6,372	10,914	728	923	11,963	189	61,000	11,521	2,252	9,269

It is worth stating that in the process of manufacture there is no nuisance.

AN ACCOUNT OF THE SEWERAGE AND IRRIGATION FARM AT BEDFORD.

By George Hurst.

In a thickly-populated country like England, the uniform removal of offensive matter from the dwellings is of immense importance. The health, comfort, and decent habits of the inhabitants are mainly preserved by the regular removal of excreta and other impure feculent accumulations from their habitations. For such salutary purpose no method that has hitherto been devised has succeeded in an equal degree with the water-closet system, combined with well-arranged sewerage, and a proper disposal of the effluent contents. Yet many towns are still deficient in sewage appurtenances, and pollute their brooks and rivers with the noxious refuse of their imperfect drainage. It becomes, then, important to inquire respecting the sewage contrivances of such places, where they have been already most elaborately and successfully executed, with a due consideration in what respect they may have been imperfect, with suggestions for improved methods, the expense of their construction, and the average cost of their maintenance.

In the town of Bedford a system of water, sewage, and irrigation works has been in operation for the last 10 years, which has been attended with satisfactory results. Previously some imperfect drains polluted the beautiful River Ouse, and the

* This does not include the urine from the urinals, which will also be treated in a short time by the machine, and when our machinery is extended and our arrangements a little more complete, attention will be given to increase the per-centage of phosphates.

* Increase. 1,140, of which 379 were for new houses—10,000 still using old privies.

greater part of the houses had offensive middens and cesspools. The town is in many respects unfavourable for drainage, lying low in the Ouse Valley, and being deficient in declivities. The fall in the lower parts is very limited, but the disadvantages have been successfully surmounted. The plan consists of a main sewer into which, from all parts of the town, lateral drains are discharged, and at the terminus of the main sewer it empties itself into a tank 16 feet deep, so that an artificial fall is obtained, from which it is pumped up, and distributed by pipes over the irrigation farm, which consists of about 180 acres. The pumping and irrigation works are distant a mile from the town.

The population of the town is about 19,000, and from the waterworks receives daily 350,000 gallons of water; the greater part of this, of course, passes from the houses and streets into the sewers, which, in addition, take a considerable quantity of subsoil drainage, making together about 700,000 gallons daily to be pumped up, and distributed over the farm. So much of the subsoil drainage passing into the sewer is owing to the main drains not having been made water-tight, which is certainly a defect, for a subsoil drain, and a sewer, when properly constructed, are not convertable, the sewers are intended to convey offensive fluids and excremental matter from our habitations, the ultimate disposal of which, and to render perfectly innocuous, has been considered a question of difficult solution. The subsoil drain is intended to convey from the land the surplus water that it may receive, and may properly be discharged into, and supply the regular water-courses.

So large a quantity of water passing into the sewers causes the manure to become excessively diluted, and, as a liquid manure, does not contribute so much richness to the soil as many suppose, and what fertilising matter it does impart to the sand, is soon exhausted by the rapid vegetation. The great value of the irrigation is not so much for the solid matter held in solution, as maintaining a constant and sufficient supply of moisture in the arid seasons. So far from land irrigated with sewage, becoming surcharged with manure, to keep it in good condition, it will bear a considerable quantity of solid in addition.

A subsoil drain should be made of porous bricks or tiles to allow the water to percolate through them, so as effectually to carry of the moisture with which the ground may be overcharged; but a sewer should be perfectly water-tight, as the quantity of water thrown down our closets, and discharged after domestic usage, will render the contents of our sewers sufficiently fluid. Beyond which, for purification or clearing away obstructions, occasional flushing will accomplish all that will be required.

The land, being near the town, is heavily rented. In such situations it is everywhere let at, what is called, accommodation price, being often required for purposes which are not expected to yield a direct agricultural profit, The average rent—it is rented of several landlords—is about five pounds per acre; but it is very suitable for the purpose, being on a bed of gravel, and the sewage water is rapidly absorbed by the soil. Excepting in very rare instances, can any unpleasant smell be observed on going over the farm, as the sewage, passing immediately into the ground at once, becomes deodorised.

The sum expended in engineering works, buildings, pumping apparatus, and embankment was £25,000, which was borrowed, to be repaid with interest by half-yearly instalments running over 35 years. It would be unreasonable to expect any portion of this sum to be obtained from the profits of the cultivation, as although directly paid out of the rates, the public is fully remunerated for the outlay by the important benefits conferred. Previously to the establishment of the sewage works, each housekeeper was at considerable expense in the removal of the offensive refuse matter, which may be considered a fair set-off against the increased assessment, besides the improved healthiness of the town, and having a clear magnificent river flowing through the town, instead of a stream turbid with various pollutions.

The production of the land has been extraordinary, and it is admitted that on no irrigation ground have more luxuriant crops been obtained. The Italian rye-grass, mangel-wurzel, and cabbages have been a great success, and the root crops generally have been distinguished for obtaining prizes at many agricultural exhibitions. Potatoes, parsnips, and other succulent crops have been cultivated with equal success. The produce has been sold by auction, and has generally realised good prices. For a public body this method of disposing of the crop is, perhaps, the most satisfactory, although a private individual might possibly turn them to better account.

During the last two or three years farming has been generally unremunerative, and the Bedford farm has only paid the rent and expenses of cultivation; but this has not been doing amiss, considering the charge for rent—altogether £928 10s. per annum. For irrigation cultivation, a dry season must always be the most successful. Italian rye-grass and roots being the principal crops, the demand being at such times very considerable, good prices are always realised. The produce sold by auction, and privately by the manager, amounted altogether in the year ending last December to £1,751 10s., and in addition a portion of meadowing was sublet at a rental of £119 17s. In favourable seasons we may fairly calculate upon obtaining, with all our disadvantages, a considerable profit.

In the tank, rags, paper, and other solid articles are intercepted by a simple grating; and the sewage is then pumped into a cast-iron tower seven feet in diameter and twelve feet in height, from which, by gravitation, it is distributed over the farm. It is first conveyed through covered piping to the land, and over twenty acres along ridges by a 9-inch half-round drain-tile, which is sunk into the ground. The ridge is twelve inches above the furrow, and the sewage water running over the tile sinks into the land, very little reaching the bottom. The other fields are less carefully laid out, but are waterered in like manner from surface furrows along the higher lines; heavy crops are regularly grown.

The effluent water percolating through the banks on the side of the land is perfectly clear and tasteless, and so purified, passes into the river.

Two engines, of 12 horse-power each, and two

centrifugal pumps, are employed at the pumping works.

The length of the main sewer exceeds a mile and a half, sufficiently capacious to serve as a reservoir during the night, and has a storm-overflow, with a self-acting flap. An excessive rainfall will pass without trouble in the night into the river.

Waterworks.

To complete the sanitary arrangements of the town, waterworks were indispensable, and accordingly formed part of the system. A good supply of excellent water was obtained by sinking a well about half a-mile distant, 40 feet deep in the oolitic limestone. This water is thrown up by pumping into a covered reservoir at the top of a hill in the neighbourhood, and is raised 170 feet above the general level of the town, and gravitates through pipes to supply the inhabitants. The pumping is performed by two engines, which work alternately; one is nominally of 40 and the other of 60-horse power.

The cost of the waterworks, piping, and all appliances connected therewith, amounted, in the first instance, to £19,600, but various additions and extension that have since been made have increased the expense incurred to £24,000. This outlay, although it may seem large, considering the extent and importance of the works, has been very economically carried out, and has been a lucrative investment. At this time the gross income per annum derived from them is no less than £2,028, which leaves a fair profit after deducting the interest of the capital, £1,080 and £700—working expenses.

The expense of these works has necessarily caused a considerable increase of the rates, and will continue to do so, until the repayment of the loans shall have been completed, when a permanent benefit and fixed capital will be secured. The cost is by no means to be regretted, as the advantages are more than commensurate with the outlay. The comfort of the inhabitants greatly improved, and the healthiness being permanently secured, the mortality of the town, according to the last returns, was little more than 19 to the 1,000 of the population, which is below the average of the country.

Dr. Prior, the Medical Officer of Health, in his report for 1878, remarks that,—

"Bedford has now reached a point at which it has come to be regarded as one of the best sewered, best appointed, and most healthy and agreeable towns of England. It is visited for the purpose of obtaining particulars as to its management by many strangers—sometimes from foreign countries."

ON THE NECESSITY OF FURTHER SANITARY LEGISLATION, AND THE PROGRESS, IF ANY, MADE IN TREATING WATER-CARRIED SEWAGE.

By C. N. Cresswell.

In the programme of proceedings of this, the Third Annual Conference, we are asked, "Whether any further legislation of a compulsory or permissive character is needed for bringing about a better sanitary condition of towns and dwellings?"

In my paper of last year there were two suggestions, which seemed to meet the approval of the Conference, viz.:—

1st. The importance of introducing the ballot in local board elections, in order to counteract the arbitrary interference of cottage landlords.

2nd. The need of county health inspectors, with such emoluments as to render them independent of parochial influences in the performance of difficult duties.

The President referred to the subject in the course of his final address, remarking that, at the next Conference, "a limited time should be given to the discussion of legislative reforms," and that it would be well for the members, during the interval, to "make themselves as fully acquainted as possible with the existing law," as there was a "great deal of sanitary law not availed of."

The whole subject of local government elections being at this moment before Mr. Hibbert's Committee of the House of Commons, we are bound to await the result of their deliberations.

With regard to the appointment of county inspectors, or superintendents, the Government has, as yet, made no sign. Possibly, it requires the stimulus of public discussion at this Conference. Meanwhile, in treating of the need of still further legislation, a large and complex subject, it will save much time and unprofitable argument to follow another recommendation made by the President last year, and "write a paper in lieu of a speech."

In the 4th and 5th paragraphs of the programme we are invited to discuss "Progress, if any, made since the last Conference."

Where is the evidence of any real advance whatever during the past 50 years? There has been much of talk, a multitude of councillors, periodical alarms, spasmodic efforts, scientific congresses, sanitary conferences, a general awakening to a sense of something defective; but the tangible results have not been even commensurate with the growth of population. On the contrary, the mischiefs of overcrowding, and the accumulations of a generation, have outstripped the tentative measures of sanitary reformers, and left them panting, halting, and discouraged in the race far behind. Our byeways may be cleaner, and the atmosphere of some towns purer, yet this has been gained at the expense of others to whom we have transferred the nuisance, changing only the *venue* without abating the evil.

It is but a short while since town and country alike disposed of its refuse on the spot, by means of middens, cesspits, and precarious dust-carts, while the earth performed the kindly office of concealing and, in a measure, converting the products of organic decay.

Water-closets soon filled the cesspits to overflow, and augmented the volume of pollution in populous places, until surface-drains were choked with filth, and the saturated soil reeked with abominations. Every wayside ditch became a conduit of diluted sewage, diffusing the mischief over a wider area, and transmitting the sulliage of each household to the precincts of others less favourably situated below it. From wayside ditch to watercourse, from watercourse to stream, is but a short step, and in 1861 the Royal Commissioners reported that "the sewage of one town had become the water

source of another." This primitive process of indolent unthrift and neglect has culminated in that which is now known as "the sewage difficulty" over the length and breadth of the land. *Monstrum horrendum, informe, ingens!* It has as many heads as the hydra, and confronts us still with unabated horrors. Here, indeed, is water-carried sewage with a vengeance, and it is asked what progress has been made (if any), since the last Conference, in grappling with it.

There has been a redundance of legislation, embodied in a tortuous series of enactments. To wit:—

The Public Health Act of 1848.
The Nuisance Removal Act of 1855.
The Local Government Act of 1855.
The Sanitary Act of 1866.
The Sewage Utilisation Act of 1867.
Finally, the whole consolidated, amended, and defined in 1875.

Legislation has dragged its slow length along while events have galloped with portentous haste, and neither imperial nor local effort keeps pace with the needs and expectancy of the nation. In 1876, popular excitement induced a palliative measure in the Rivers Pollution Prevention Act, but that measure has failed of its purpose, and given to wrongdoers a quasi-legislative sanction for their delinquencies and incapacity. At the same time, the Thames Conservancy Acts of 1857 and 1867, after much ado about nothing, have suffered a palsy, and received their *quietus*—for a time, at least—in the Lower Thames Valley Drainage Act of last year. In the meantime, a cry has gone up for water—water for the food and ablutions of man as well as the requirements of our great staple industries. Every river, from the Tay to the Dart, has been contaminated with the refuse of homestead or factory. The salmon kelts of Westmoreland and Cumberland are in process of destruction by a parasitic fungus plant, the newest development of sewage pollution; and, while professors dispute as to final causes, and means of prevention, the patient public waits for the *Deus ex machinâ*, in the form of some miraculous intervention to save them from the natural consequence of their own apathy and ignorance. In presence of these and other startling phenomena, where shall we seek the signs of progress, or compute the net results of practical sanitation?

The national anxiety finds relief in a popular cry; that form of generalisation so acceptable to shallow minds, inasmuch as it relieves them of the pain of thinking for themselves, and saves time by precluding argument.

Centralisation, it is said, is the fountain source of these sanitary shortcomings, and it is above all things needful to revivify the civic life and vigour of the people, in order to resist the centripetal tendencies of our time. It is but a half-truth after all; for the action of a central authority is as necessary to the body-politic, as the motive power of the heart to the circulation of the human system. Nevertheless that action may be strained and abused, as we see too plainly in the modern tendency towards meddling and muddling with subordinate authorities in matters beyond the scope, and outside the functions of imperial control.

In this respect it may be expedient to reorganise the Local Government Department, and re-adjust it on its own proper bearings. Further legislation in this direction will rid us of that red-tape and circumlocution, which encompasses every limb and paralyses the functions of local bodies, reducing independent self-government to the shadow of an empty name. From the investigation of a grand scheme of arterial drainage to the contents of a workhouse plum-pudding is a wide range of official supervision, yet nothing is too large or too minute for the elephantine prehension of the Whitehall department. There is a veritable plague of inspectors abroad, and the native stubborness of the provincial mind, although it may need the spur and impulse of the central authority to set it in motion, resents this constant yoke of official supervision, which will not permit the expenditure of a few pounds, or the construction of a workhouse pig-stye without a local inquiry and departmental sanction.

This was not the intent of those who framed the Public Health Acts, nor is the system compatible with the divine right of self-government. The functions of Imperial administration end where those of local self-government begin; each has its proper uses in the economy of the State; and there is scope enough for each within its own particular province. The Rivers Pollution Prevention Act is in point. Such is the superfluity of safeguards and precautions in the provisions of that Act, that none save a Government department would venture to put it in force—nor can a sanitary authority take any proceedings under it without the consent of the Local Government Board. Here then was a field for the energies of Government, where both the resources and influence of the State might be usefully employed.

Yet nothing has been done to enforce or direct the operation of an Act which is, as it were, still-born, and truly a most lame and impotent piece of legislation! On the contrary we can cite cases where local enterprise has been hampered; and official interference has blunted the edge of many a bold resolve on the part of those who have striven humbly but honestly to help themselves.

Reading and Oxford have been permitted to embark with a light heart upon a grand experiment of sewage utilisation, because the method of disposal coincides with the procrustean theories of the Local Government Board. According to the rigid formula now in vogue in high places, every authority is required to fit the same bed, and conform to the same standard, without regard to local conditions, or the measure of local resources. If we appeal for aid and light to the great central luminary, it makes but one sign; and recognises but one shibboleth in the darkness. Irrigation is their grand climacteric; and as all roads lead to Rome, so all official intervention tends in one direction. If the Government be right, this is the be-all and end-all of sanitary progress, and the Conference may dismiss all other modes of treatment as irrelevant and futile. It is a gloomy prospect for the Lower Thames Valley; where the suggestion sounds like a sorry jest, and land consists of tennis-lawns and croquet ground relieved here and there by paddocks at a rent of £50 per acre per annum. In this quarter, "union of districts" is the latest development of sanitary enterprise, but the conception is still in

the process of gestation, and when brought to maturity may prove to be a monster of terrible import and insatiable appetite. At present it is regarded with more sympathy by engineers, than by the ratepayers concerned, and despite the favourable augury of official approval their minds are disquieted within them.

The town of Ashford, Kent, has long been in labour with a project of sewage disposal, and after much investigation resolved to adopt a process of precipitation. Upon application to the Local Government Board, they were informed "that no system of purification by means of chemicals would enable them to dispose of their sewage satisfactorily, or produce an effluent fit to flow into the river;" and of course filtration over land was the alternative suggested.

Whether "land at a reasonable price can be procured with favourable natural gradients, with soil of a suitable quality and in sufficient quantity" (to quote the words of our own report in June, 1876) is a problem yet unsolved. At all events Ashford remains undrained to this day, and we must look elsewhere to find "progress, if any, in treating water-carried sewage."

Berkhampstead is in like case, and received a like reply, viz., "that chemical precipitation is insufficient and must be condemned."

Salisbury has fared no better; and to the appeal of Trowbridge for help in their trouble the Delphian oracle replied, "There is no other system which will render sewage effluents pure, than irrigation over land."

It may be true as an abstract proposition, but it is cold comfort to Salisbury and her sisters in distress, a long catalogue of towns, as Worcester, Stafford, St. Albans, Brentford, Isleworth, *cum multis aliis*. In the meantime Aylesbury has overcome its difficulties by means of precipitation, and the townships of West Herts would fain imitate the example, seeing that the Aylesbury Board of Health passed unanimously a resolution on the 14th January last to the effect "that they are prefectly satisfied with the mode of treatment adopted for the disposal of the sewage of their town."

Whether West Hertfordshire will be permitted to govern itself in this matter is doubtful, since the Local Government Board adheres to its official utterances, "that the only effectual modes are filtration through land, or irrigation over land;" and, again, "there is no process by which sewage can be so purified in tanks as not to ferment."

This latter assertion, made in May, 1877, a few days after the close of our Sanitary Conference, is at variance with the scientific authority of such men as Angus Smith, Keats, Letheby, Crookes, and with the experience of many of us in this hall. Moreover, it conflicts with the recorded conclusions of the Blue-book of July, 1876, and the Report of our Executive Committee, dated June, 1876, embodied by the Government in their own Appendix, where it is reported for our guidance that, "with regard to the various processes of subsidence, precipitation and filtration, it is evident that by some of them a sufficiently purified effluent can be produced for discharge, without injurious result, into water courses and rivers of sufficient magnitude, &c." Here we have the opinion of experienced men in language clear, concise, and convincing, yet the Government declines to quit the grooves of its antiquated traditions, and commits itself to dogmas with a pertinacity worthy of the Roman syllabus.

So long as this is the condition of the official mind, there can neither be hope of progress nor "a better sanitary condition of towns and dwellings." These periodic Conferences will be labour in vain, and the assembly of practical sanitarians, from all parts of the kingdom, can lead to none other result than a record of defeated schemes, disappointed enterprise, and universal stagnation.

One is tempted to inquire—for what great purpose the Local Government Board has been constituted, when applications for advice are met by common forms, savouring more of the retort courteous than official encouragement. "The Board cannot, under the circumstances, advise the authorities of ——" Or "Referring to the subject of your letter, the Board declines to express an opinion. , . . . &c."

There is, however, a ray of light in the darkness. The Bill now before Parliament, for the constitution of County Financial Boards, or Local Parliaments in every county, promises to unloose the deadlock of sanitary administration. The complex machine creaks upon its hinges, but a new lever is forthcoming to help on the work.

These County Boards should do the work of local supervision, not only sanctioning loans, but granting them out of local funds contributed within the district, and secured by the best of all safeguards, viz , the resources of the immediate district, developed and improved by the expenditure of monies so obtained. The power to authorise the purchase of lands for sanitary objects —at present only attainable by an Act of the Imperial Legislature—if conferred on these new constitutions, would relieve sanitary authorities from the elaborate procedure of the Lands' Clauses Act, while the utilisation of local resources would put a stop to that drain on the national exchequer which has already excited alarm in high quarters. Those who furnish the means, and those who sanction the outlay, would alike be on the spot to watch and control the work, and thus, in lieu of local government, in leading strings, hampered by perpetual inquiries, adjournments, delay, taught to look to Jupiter rather than self-help, and leaning too often on a broken reed, we should at length realise that kind of authority which our President foreshadowed from his place in Parliament as having "vitality, cohesion, adaptability, strength enough to resist the centralising tendencies of the day," and providing a means of political education for all classes of the people.

There are enough of questions to occupy the time and attention of superior authority at Whitehall. The Pollution of Rivers Act, the investigation of scientific processes, the definition of new areas, and simplification of old, the collation of statistical data in order to determine the course of future legislation, these and cognate subjects appertain to imperial administration, and would enable the department to regain its proper sphere of usefulness. It is because the latest measure of Government has been conceived in this spirit, and is capable of still wider development in this direction, that it deserves the earnest support of the Conference; and we trust that members will

not separate without recording their approval of the general scope of the Bill, thereby strengthening the hands of its supporters in and out of Parliament.

Having thus indicated the need of further legislation in three particular directions—

1. The protection of the ballot in the election of members of Local Boards, in order to counteract the influence of small tenement proprietors, always and everywhere the interested opponents of sanitary progress.

2. The appointment of medical superintendents in each county or division of a county.

3. The first great step towards decentralisation by the constitution of County Boards, so as to habituate the people to self-government, and prepare them for the eventual introduction of provincial Parliaments.

I have yet to mention another indispensable factor in the work of bringing about that "better sanitary condition of towns and dwellings," which is the real aim and object of these Conferences, viz., a loyal resolve on the part of all concerned, whether governors or governed, to do the work which they have undertaken to do. Local authorities do not move unless there be pressure from without, as well as from within. It is not in the nature of such bodies to initiate improvements, *mero motu*. Their bent and tendency is one of resistance to all reforms which involve a possible increase of the rates; nor can we recall a single instance during the past twenty years, where a corporate body has volunteered to improve the conditions of things around it, except the courts of law had applied the spur to the flank of their lagging energies. Sanitary progress is a monotonous tale of injunctions granted, or informations filed, at the instance of individual inhabitants, for the abatement of nuisances which the corporate authorities had suffered in silence, connived at, or ignored; and the reason is obvious, viz., that the Boards consist in great part of the principal delinquents, or their satellites. Even Parliament is not proof against the canker of vested interests, and legislative measures "of great pith and moment their currents turn awry" by reason of timid acquiescence or untimely concessions.

The opposition of the Metropolitan Board of Works to the Rivers' Pollution Prevention Act was disarmed by the introduction of clauses specially exempting the chiefest offender from its operation. Upon what principle, logical or sanitary, is the noblest river of the kingdom thus doomed to perpetual defilement, and the metropolis of civilisation set above the law of the land, like the old "benefit of clergy" in the days of the Plantagenets? Is it that the enormity of the dereliction takes the case out of the category of sanitary measures? or that a right to foul its own nest has vested by prescription in the City of London? The right of pollution, and the impunity of wilful waste in this case is the creation of the Legislature, and a political compromise. In others, it is the result of sheer apathy and ignorance combined. It is otherwise in the North, where Manchester and Halifax, Rochdale and Leeds, are grappling boldly with this pollution, and Professor Ansted has shown us, that it is more economical to keep excrementitious matter out of drains, than to separate the diluted sewage at the point of outfall. If, however, it be found impracticable in our large towns to dispense with water as a vehicle for removing fæcal refuse, can we not learn a lesson from the analogy of nature and the physiology of the human frame? Solids and fluids are poured into the same gullet, and commingle in the same vessel, yet they are separated again before discharge by the secreting organs of the animal body; which things are an allegory not unworthy of the attention of the metropolitan authorities, who were careful by their Act of 1858, both to acquire the powers of taking lands for deodorising sewage, and to define "deodorise" as including the separation of "solid suspended matters in sewage" from "the liquid before the discharge thereof." It is strange that nothing has yet been done to give effect to these important clauses; but says Mr. Norman Bazalgette, the doughty champion of the new philosophy of waste, "The cost will be enormous, and the process a nuisance." We admit the cost, but categorically deny the nuisance. As to the first, it is a question of comparative evils; as to the latter, we have abundant evidence in refutation. Take for instance Leeds, which at considerable cost of money and experimentation has ascertained the best available method of defecating its sewage, and possesses, if only it be willing to employ it, the means of passing without nuisance a comparatively pure effluent into the river. But the stream flows by still foul and fetid as ever from the upper reaches, changing its hue with each particular dye, and polluted with the refuse of tanneries and cloth factories. What is the use then of defecation at Leeds, even if the effluent were as Apollinaris water itself, where all salutary effects are lost in a maze of filth pouring down from the towns above it? and what is the resulting advantage of exacting compliance with sanitary laws from one town, while permitting others to pollute the same stream in a geometric progression of filthiness through its whole course above and below? Surely this is matter for the intervention of the Local Government Board, if it be minded in all loyalty and thoroughness to do that work, which the Government alone effectually can do. The energy of Leeds should be supplemented by fearlessness and impartiality at head-quarters, whence the impulse must come, if we may ever hope to realise the end of sanitary legislation. Ten righteous men, we are told, would have saved Sodom. If even one of our rivers throughout the length and breadth of the land has been rescued during the past year from abomination, it will be an answer to the query set forth in our programme, and we shall not be without encouragement for the future. *O fortunati nimium!* if any delegates present can point to so desirable a consummation.

Even in the reign of Henry VIII., an Act was necessary to prohibit "the annoying of the stream of the River Thames by casting of dung, rubbish, or other thing in the same river." The statute, however, did not prevent a long succession of pestilences, and it remained for the Great Fire of 1666 to thoroughly disinfect the plague-spots of the metropolis. In 1667, the first urban sanitary Act was passed, and provision made for the construction of sewers, or rather "fresh water trenches," which it was a misdemeanour to pol-

lute by house drainage or other offensive matters. We owe to the visitation of the cholera at a later epoch the tardy inauguration of a system of sewage disposal by water carriage, which has produced a fresh type of zymotic disease traceable to sewage sources, but especially to the vicious construction of houses, whereby typhoid fever is laid on with the same precision as hydrocarbon gas for the purposes of illumination.

Dr. Murchison has distinguished this new revelation from its prototype typhus; and Dr. Fergus has proved abundantly, that in Glasgow, where it has raged at intervals from the year 1836, it arose from a badly-constructed system of flushing by water; but whatsoever be the *fons et origo mali*, that town has decided that it would be tempting Providence to wait supinely for another portent, and appears at last to be in earnest in the attempt to set its house in order. River pollution is a vital question, concerning both the health and food of the people, and let us hope that before the census of 1881 shall have told its tale, we may have achieved something to avert the recurrence of a national pestilence.

ADDITIONAL INFORMATION RESPECTING WATER-CARRIED SEWAGE TREATMENT.

By J. C. Mellis, C.E.

Having upon two previous occasions contributed a short account of the treatment of the sewage of Coventry, it may not be interesting to record after another year's experience, that the method abopted there still continues to merit the success which it had already obtained.

The Corporation now lease their work to the Rivers Purification Association, who, for an annual subsidy paid to them, relieve the Corporation from all trouble, and undertake the whole work and responsibility in connection with the sewage, an arrangement which appears to afford complete satisfaction to the Corporation, to the landed proprietors along the banks of the River Sherburne, and to all others whose interests are concerned. It appears worthy of notice that each year's experience has the effect of reducing the cost of dealing with the sewage. This is brought about in various ways, but perhaps chiefly through improvements in the method of manufacturing the chemicals employed. It will, doubtless, be remembered that the works at Coventry included several buildings and a large amount of machinery for drying the sludge into a portable manure by artificial heat. This is not now found desirable, as the sludge is sold or disposed of in the immediate neighbourhood of the works in a similar condition to farmyard manure; and to bring it into this condition presses are about to be employed instead of the drying machine; a model of one of these presses will, I understand, be shown amongst the sanitary appliances at the Society of Arts Exhibition this year. These alterations will dispense with some £4,000 worth of buildings and machinery, which are now no longer in use at the Coventry works. As some of these changes have only very recently been put into operation, it may be as well to defer for another year giving the reduced cost of working, when accurate accounts can be supplied. It has upon former occasions been stated that Coventry is representative of a thoroughly manufacturing town, so far as its sewage is concerned, and does not afford data for a direct comparison with towns having domestic sewage. Information relating to domestic sewage may, however, now be obtained from the town of Hertford, where the same process is in operation, and where the sewage is of a domestic character. The Corporation of Hertford have made a contract similar to the Corporation of Coventry, and the following particulars of the treatment of the sewage of this place, I think, may be useful.

Hertford is situated on the River Lea, whence the New River Company derives its water supply, and purification of the sewage needs to be efficiently accomplished; the population is 7,169. The average daily flow of sewage, owing to a very large leakage of subsoil water into the sewers, was once as high as 1,640,000 gallons, but is now estimated at 1,000,000 gallons, or 140 gallons per head of the population. Water-closets are in general use.

From the year 1858 to 1875, the sewage was subjected to the lime process, and then was dealt with for a time by the Phosphate Sewage Company, under the impression that a valuable manure would result from its treatment. These expectations were not realised, and a short time ago, the lime process was reverted to, but failed to accomplish the requisite degree of purity, and the Coventry process replaced it. The works are exceedingly simple, and the effluent water after chemical treatment is passed through artificial filters instead of through land as at Coventry, there being no land available.

WATER-CARRIED SEWAGE AND CEMENT MANUFACTURE.

By James Richards.

The directors of Scott's Sewage Company (Limited) have instructed me, as their secretary, to bring before the Conference on Health and Sewage the success which attended their operations in preventing the pollution of the Pendle water, a branch of the Calder River, and utilising the precipitated sludge, by making cements of various kinds, at their works, at Duckpits, Burnley, in Lancashire.

Members of the Society of Arts, engineers, sanitary authorities, and the public at large, are invited to inspect these works, two miles from Burnley, Lancashire, which show how the pollution of any river by sewage can be effectually prevented. A clear effluent is obtained possessing improved fertilising properties, if required for agricultural purposes, but which otherwise may be allowed, without detriment to water, to flow into any river, whilst at the same time, all the nuisance arising from the noxious sludge is avoided by itsconversion into Portland and other hydraulic cements, which compete in quality and price with the best cements sold in the neighbourhood.

The Corporation of Burnley, some years ago, were prohibited by injunction from allowing the effluent from the sewers of the town to flow into and pollute the River Calder. The Corporation and Scott's Company entered into a contract, whereby Scott's Company engaged to produce, and have produced a clear effluent, the injunction has

been put aside, and the effluent now passes into the river, and the Corporation has recorded its satisfaction at the results.

The work at Duckpits have been erected by the Corporation of Burnley, after the designs of Mr. W. B. Bryan, C.E., which exemplify the latest scientific views on the subject, in order to deal with all the sewage of the town and district except the floods of storm matter, which pass through the sewers, and at times are great, caused by the heavy rains, which in 1876 varied from 38 inches to 44 inches at Burnley.

The Corporation deliver the sewage into the tanks, and then Scott's Company purifies it by lime precipitation and filtration through coke. The clear effluent passes into the Pendle water, which joins the River Calder.

The sludge, always an offensive difficulty, which has not hitherto been dealt with satisfactorily, is entirely cleared away by its conversion into cements, Portland, hydraulic, and Roman cements. All cement that has hitherto been made has been sold or used in the works.

Some doubts have been expressed, if in the wide extension of this system there will be a sufficient demand for the cements, but they may be answered by remembering that as long as buildings are wanted, and concrete walls are cheaper and more durable than brickwork, the use of cement is practically unlimited.

The company is open to make contracts with any other sanitary authority, and give a guarantee of success. The nature of the contract and the cost of working the processes are determined by local circumstances. The total cost of the cement process gives satisfactory results in the effluent, and disposes of the sludge at a rate as cheap as the average cost of the several experimental processes stated in the Local Government report of 1876; and will not exceed 7d. in the pound yearly on the rateable value, unless the local circumstances are very unfavourable.

The following are the testimonials, in favour of these processes, given by the highest engineering and chemical authorities, and they can no longer be disputed, Scott's Company having now proved their soundness:—

The Lime Process.

Dr. J. H. Gilbert, F.R.S., Royal Commissioner on the Sewage of Towns, says:—

"Of all the disinfecting methods which have yet been proposed, I believe that which is known as the lime process is by far the most practicable and effective on a large scale. The lime process does effectually remove this solid suspended matter, and in so far accomplishes a great and manifest good. It also destroys the influence of the noxious gases of sewage, and . . . . . we are of opinion that wherever this (clarified) liquid (sewage) is thrown into a body of water considerably larger than itself, no evil results will practically be experienced."

The Cement Process—Economy.

Dr. Odling, F.R.S., says:—

1. "Economically, the scheme seems to me the most promising of all which has been introduced for the purpose of dealing with sewage, and throwing down the sludge from it, and then dealing with the solid portion, so as to convert it into a useful marketable article. I do not think there is any commercial value in the material that will be extracted at Dunton, unless they make it into cement."

No Nuisance.

Dr. Frankland, F.R.S., says:—

2. "I should prefer to treat it with lime alone, and to use the sludge according to General Scott's process, which does not occasion the slightest nuisance."

Fish can Live in Limed Water.

Professor Crookes and General Scott have both stated in the discussions at the Society of Arts, that fish would live in it.

Not Unhealthy.

Dr. Frankland, F.R.S., says:—

3. "That deposit would be first dried, and then burnt in kilns, and then transformed into Portland cement. That appears to me to be the process of dealing with this sludge, which has always been a difficulty. It appears to me that this is the process least open to objection. I think it is very perfect in preventing nuisance. I would just say to that portion of the meeting who are not chemists, as to the gases produced in burning the cement, that this process of burning the carbon of the organic matter in the original sewage converts it into carbonic acid gas, and the only thing that can do harm is carbonic acid gas which exists in the atmosphere, and is diffused so rapidly through the atmosphere that, at a distance of 100 yards from the kiln, it would be difficult to find more carbonic acid gas than is normally there."

"In a sanitary point of view, the careful precipitation of sewage with lime has undoubtedly been very successful."—Dr. Letheby.

4. Colonel Francis having remarked at a public meeting, in 1872, "That looking to the deleterious matters contained in the original sewage, he thought that making cement from these materials, buildings might be injurious to public health." Dr. Frankland replied: "There can be no possibility of injury; all chemists are agreed upon that."

Dr. Voelcker says:—

5. "I wish to bear testimony to the fact that the process of drying and manufacturing the dried material into cement could be carried on in the immediate neighbourhood of the town where the sewage was obtained, without creating the slightest nuisance."

Equal to Excellent Portland Cement.

Professor Abel, F.R.S., says:—

6. "I examined them (specimens of the deposits), not merely in regard to their power of being converted regularly into a species of cement, but also with regard to the quality of cement; and I found it was equal to excellent Portland cement."

7. Q. "I understand you to say that it (the sludge) was converted into something more solid than that?"—A. " . . . It can be converted, by General Scott's process, into a very useful and valuable cement." Q. "That cement is manufactured out of the sludge so deposited?"—A. "Yes; and a very excellent cement it is."—Evidence by Mr. J. Hawksley, then President of Institution of Civil Engineers.

8. Q. "Have you formed an opinion as to whether the process was a valuable one, and likely to come into general use?"—A. "I think it is; I have the very highest opinion of it."—Mr. Bramwell, C.E., F.R.S.

9. "General Scott's plan, as far as I am aware, is certainly the best, and I really hope that it will prove successful, and be adopted in many parts of the country."—Mr. R. Grantham, President of the Committee on Sewage of the British Association.

16. "His process is very simple; does not require any very great outlay; and, so far as it goes, is thoroughly successful. He professes to clarify the sewage; to deodorise the effluent water temporarily, and the sludge permanently; and he does it. He also professes to make a very good hydraulic cement, of any desired strength; and he does it."—Mr. W. Hope, V.C.

11. "He calculated, therefore, that two tons and a half of this cement would be obtained from a million gallons of sewage. That would be about a ton for every 10,000 people per day. Well, he did not know what might be the demand for cement, but it did not strike him, at first sight, as being a very large quantity. Such a quantity might very well be used in building operations."—Dr. Letheby.

SEWAGE PRECIPITATION.—A RECOMMENDATION.

By William White.

As to sewage purification, it has to be admitted that at present authority is wholly in favour of irrigation; and so much so, that other methods are regarded as unworthy of discussion. It is allowed that there may be circumstances in which irrigation is not conveniently practicable; but the concession is made so reluctantly as to beget the suspicion, that if only the requisite pains were taken, the true panacea would be found available.

Such a condition of opinion is to be regretted for several reasons. It is certain that there are many towns so situated that irrigation is an impossible prescription, unless at ruinous expenditure; and there are other towns where the sewage is so contaminated with manufacturing refuse as would render it a source of blight instead of fertility.

Communities so circumstanced are therefore compelled to resort to precipitation; but left without competent counsel and guidance, are apt to fall into the hands of adventurers whose promises are as liberal as they are fabulous. What do the run of town councillors know of the chemistry of sewage? And yet on such councillors is laid the burden of selecting the process whereby foul waters are to be turned into clean. Left to act according to such light as they can command, it is not surprising that they become responsible for many absurdities. One has not to go far to find sewage subjected to treatment which effects little improvement at considerable cost. There is a town in Staffordshire where, at this hour, sulphuric acid and lime are simultaneously run into the current of the sewage, and where mayor and aldermen go about proclaiming that nothing can be more successful than the system they have adopted.

Again, if one fact has been made clearer than another, it is that the sludge deposited from sewage is worth little or nothing to the farmer; and yet a town council recently entered into an onerous contract on the faith of obtaining 26s. per ton for their raw sludge.

Again, there are many sewage works where sewage already alkaline is dosed with lime, and an effluent considerably more pernicious than the original sewage turned into the rivers. On some occasions remonstrance is met with the observation, that although the treatment may do little good, it is necessary to do something to satisfy the Local Government Board; and apparently the Board is easily satisfied.

Now, what I wish to maintain is, that it is a grave mistake for the Local Government Board thus to leave towns to their own devices in the matter of sewage precipitation. I have nothing to say against irrigation, the ideal method of sewage disposal; but that where irrigation is impracticable, the most efficient method of precipitation should be indicated or recommended. And to do so to good purpose, it would be advisable to issue a Commission to examine and report upon methods of precipitation. It is of great importance that the proper use of lime should be defined so as to check its profuse and indiscriminate employment. Also to define the proper use of other popular precipitants, such as the sulphates of aluminum and iron, the chlorides of iron, aluminum and calcium, and the various solutions of the phosphates of calcium and aluminum. Along with the definition of the uses of these chemicals would go a classification of various classes of sewage, concentrated or dilute, domestic or manufacturing.

In short, without such information and guidance, it is matter of luck whether a public body that "goes in" for precipitation does not commit some incredible folly—incredible, I mean, to a chemist. The ignorance and assurance that stalk about delivering judgment on sewage purification have to be met to be appreciated, and it is high time that they be confronted with sound information.

VENTILATION OF SEWERS AND DRAINS.

By D. Ainley, M.R.C.S., L.R.C.P., &c., Officer of Health.

In the following remarks I wish to speak but briefly on the theory of sewer ventilation, and more fully on the practical results of the various systems in operation; for we have nowadays quite a legion of fanciful and unworkable ideas which must early die, on account of their incompatibility with existing laws, habits, and conditions of the people.

Given a certain condition, viz., a network of sewers, and we have sewer gases. Their nature and formulæ are well known; but we are most concerned with their disease-producing power. That they are capable of generating disease which kills thousands, and prostrates tens of thousands annually, is generally admitted, hence the laudable ingenuity and activity in devising means to keep asunder sewer gases and human beings.

Such devices have been numerous. Among the first were "traps" of various kinds and names, and from our past experience, we can see that they have literally fulfilled their names; not only "traps," but "mantraps;" for thousands, trusting to their protection, have been deceived, and found them a delusion and a snare.

Then we had the introduction of upright pipes or shafts from the main sewers into the streets, and from w.c.'s up to the housetop; and then came the conflict of opinion as to the density and behaviour of sewer gases, whether they would go up these tubes, or whether they would not require some apparatus to draw them up, without which they would be of no use, and this matter was so

unsettled, that each person was left to follow out his own notion as to what was best. Last year the great idea in advance may be expressed in one word, viz., "disconnection," and there can be no doubt of the value and importance which that word implies, and of the myriad dangers which its application would prevent; but, as supplementing, or rendering unnecessary all the past schemes, we have what may be termed ventilation by exhaustion, and in a few words I will describe its principle and mechanism. The system is known as "Stott's system." It consists in connecting sewers and drains with the furnaces of steam boilers, or other furnaces with a strong draught. For this purpose the ashes place is enclosed by a door so as to connect the pipe from the sewer or drain in any convenient manner. In all cases, however, it will be observed that the furnace to which a sewer or drain is connected for the purposes of ventilation, the connection must be so arranged that the furnace must only receive its supply of air to support combustion from such sewer or drain. Consequently, it must be continually exhausting the said sewers and drains of foul gases, which must also pass through the fire and be consumed, or rendered harmless.

After making a number of experiments on the spot with the above system, Dr. Augus Smith wrote the following:—

Some of the admired plans for ventilating sewers are positively dangerous, others are simply valueless. When the sewer air is brought through the fire as by your method, it is impossible to imagine that it can escape purification to some extent, and one question of prominent importance is, to what extent?

It is extremely probable that the destruction of all dangerous substances was complete in such cases as I saw. So far as we know, the substances to be destroyed are not very stable bodies and are readily decomposed. We may say with safety that the method in question, viz., passing the sewer gases through the great fires of factories will remove the most dangereus properties, and, if the speed of passage be not too great, the purification will be complete. If sulphuretted hydrogen be present it will burn, and the sulphurous acid formed will pass up with the same acid from the coals. If carbonic acid be in excess, it will pass up the chimney with the carbonic acid so constantly formed in the fire. If organic substances, either as germs or more developed living forms be present, they will not endure the heat unless driven through with great rapidity, and if the substances are in a state of putrefaction, that state will be destroyed by a similar heat. The result then is easily known so far as theory goes; the process if performed well must render the purification complete. So far as practice is concerned, we may be sure that some and even the greater part in many cases of the noxious matters will be thoroughly rendered innocent, whether all or not is a question of size of furnace, amount of air passing, time of passage, and so on.

The next point to be considered is—to what extent in the sewer is the current of air formed, or we may say, how far will one fire, burning a given amount of fuel, cause a draught in a sewer of a given size. It will require a good deal of experience to answer this question, and that experience can be obtained only by the use of the method in various situations, and I certainly feel justified in recommending that it should be tried and its action carefully examined. The distance to which the draught of air will extend in any sewer depends on the condition of the sewer as well as of the furnace, and I could not pretend to follow the matter into details without abundant experiment. I can say, however, that to cause the currents of air to pass from the interior of our houses into the sewer rather than in a contrary direction, would be to do an incalculable service to a great population, and, indeed, I doubt if there be any one sanitary problem of equal importance before us. It is sufficiently evident that your method solves it to some extent, and I believe it to be equally clear that it is the duty of those, who have the means in their power, to find to what extent the matter is applicable. If the range of action in the sewers be great, the public benefit will be great also. I hope the inquiry will be rigourously made.

The question then is, to what extent will the furnace exhaust the sewer, for it may be admitted that when once the gases and organic bodies are through the fires very little harm can they do.

The first experiment was made at West Vale, near Halifax; the amount of air passing through the fire was measured by the anemometer, and was 980 cubic feet per minute. The question then was, where does this air come from, or how far? The nearest opening was 7 yards from the furnace, and the furthest 300 yards away, and between the two points, 15 other openings or open gullies. Down each of these gullies the anemometer did not register more than about 20 cubic feet, but the fact was abundantly established that, in all of them, remote as well as near, there was a down current. The whole of these gullies were then made up, not absolutely, but in a rough and ready fashion, and the anemometer placed at the extremity of the sewer, when it indicated 490 cubic feet per minute, thus showing that, with well trapped gullies, the effect must extend over a very considerable area.

The next application of the system was to the Halifax Union Poorhouse, where some 400 inmates are constantly housed. The guardians in their report say that, since the adoption of Mr. Stott's system in the house, the bad smells, which have taken tons of chloride of lime to disinfect, have been entirely removed; that, although upwards of 150 cases of small-pox and fever have been brought into the infirmaries in a few months, with only four deaths, not one case has occurred among the inmates of any infectious disease; such immunity was never known before the sewers and drains were connected with the boilers.

The Corporation of Halifax then took it up, to see whether such connection with the boilers of mills would remove the complaints of bad smells from certain neighbourhoods. The first complaint came from one of the best parts of the town; it was loud and strong, the stench rising into some of the houses at certain times was unbearable; upon investigation, the cause was clearly discovered, viz., the passage into the sewers from several factories where wool was washed of the residual liquor after the soap had been extracted by the addition of sulphuric acid. This liquor, I need not say, was peculiarly offensive. The question then was, shall we stop the business in which this was made, or shall we find a remedy? As our wish was always to interfere as little as possible with business, we decided to connect the sewers with the furnaces of two of the factories; the result has been that we have not had a single complaint since. I ought to add that, several of the complaining houses were half a mile from the factories.

Shortly afterwards, in nearly the centre of the town, a similar complaint was made; it was only at certain well defined times of the day that the stench was so very offensive, and we ascertained that these were the times when the liquid was run into the sewers out of the large cisterns in which it had been stored, so we tried the experiment of running off the liquid at midnight, thinking, of course, to cheat the people, but the effect was that some scores of people had to turn out of bed and out of doors too, to escape the noxious effluvia. We then connected the sewer with the boiler of the factory, continuing to use the drains as before, without a single complaint. This extends over a period of four years. A number of similar cases could be added, but the story is the same, viz., complaints which have found their remedy, thorough, effectual and simple, in the connection, on Stott's principle, of the sewers with the furnace of some factory or other furnace having a strong draught.

In 1873, the furnace of Castle Mills, Oldham, was connected with the sewers on Stott's principle, and after giving general satisfaction over a lengthened period, on the recommendation of Dr. Sutton, the Medical Officer of Health, the Corporation decided to have six other connections made in the most complaining parts of the town, and the following were made in 1876:—

	Area of connecting pipes.	No. of revolutions of the anemometer.	Cubic feet of air passing per minute
	in. in.		
Albion Mills ..	22 × 7½	6½	750
Horsedge Mills ..	23 × 7	13	1,520
Britannia Mills ..	21 × 6	10½	920
Providence Mills ..	22 × 8	6½	800
Hope Mills ..	20 × 8	10	1,090
Castle Mills ..	15 × 15	4½	700
			5,780

Thus we have for the six mills 5,780 cubic feet of air drawn through the sewers per minute; or for a day of 10½ hours, 3,641,400 cubic feet. When these had been in operation 12 months, Dr. Sutton gave a report to his committee, in which he says:—

"All are working well except one, the fireman stating that when the apparatus is closed, there is not sufficient draught for the fire, consequently the doors have to be opened. If it had been connected with Gravel-walks drain, as I recommended, instead of the Cross-street drain, it would have worked well, the drain in Gravel-walks being much larger. Several of the householders in the neighbourhood complain that the offensive smells from the street grids are as bad now as they were 12 months ago. (Query—Because the apparatus is not working). The inhabitants who resided some time previous to the adoption of this system in the other parts, informed Inspector Walton and myself that the offensive smells were considerably lessened, a result which they principally attributed to Stott's patent; but as Mr. Rawlinson, the Consulting Engineer to the Local Government Board, and who visited Oldham previous to my appointment, urged upon the Council the importance of removing the grid traps throughout the town for the purpose of promoting free ventilation, and which was carried out, a great portion of the efficacy of Stott's system is counteracted; but even under these circumstances a considerable amount of foul air is conducted from the tributary drains to the furnaces where the sulphuretted hydrogen, ammonia, and organic compounds pass through the fire, and are rendered innocuous."

In the first week of this month (May) Dr. Sutton made a further inspection of the district partially under Stott's system, and the following is his report:—

Officer of Health's Department,
Town-hall, Oldham. May 3rd, 1878.

Upon inspection, during this week, I find in every case where the same tenants now reside, who did so in September, 1877, that they, one and all, highly appreciate the great improvements of the atmosphere of their houses. Frequent complaints were formerly made to me of their rejecting their food, caused by the fœtid steam being blown into the streets through the grids, and their houses through the slopstone pipes, and the mortality by simple continued fever and convulsions is materially reduced. I entertain the same opinion which I have always held, that in closely-confined and densely-populated districts, nothing surpasses this method of dealing with sewer gas.

J. M. Sutton, M.D.

Two years ago the managers of Smedley's establishment, at Matlock, not satisfied with the sanitary condition of the place, applied to Mr. Stott with regard to his invention, with the view of rendering the place as healthy as it was possible to make it. Mr. Stott examined the drainage, and suggested that the whole of the drains should be connected together, and then attached to the boiler on his principle. This was done in a most satisfactory manner, and the result has been all that could be desired. The large diagram shows the drains, and their mode of connection.

In conclusion, it will not be out of place to state that this principle is well adapted for the ventilation of steamships, by making the heat of the funnel the exhauster of the foul air below; nothing can possibly be simpler, more effectual, or more economical.

And just as I finish this paper comes the sad news of the explosion on board the mail steamer *Sardinian*, the facts of which are all well known to you; suffice it to say, that if this principle had been carried out on that steamer, such a catastrophe would have been an absolute impossibility.

FIVE YEARS' EXPERIENCE OF THE COCKERMOUTH METHOD OF DEALING WITH EXCRETA; AND A SUGGESTED ENLARGEMENT OF THE 40TH SECTION OF THE PUBLIC HEALTH ACT OF 1875.

By John Makinson Fox.

Medical Officer of Health, Mid-Cheshire.

Wherever the human race is or has been found, there the excremental function is, and has been, performed. This is true of every age, of every place, of every dynasty, and of every religion and varying degree of civilisation. And its perpetual recurrence, and its intimate connection with the health and comfort of individuals, families, and communities, renders it everywhere and always equally obtrusive.

And yet, in the year 1874 of the Christian era, the report of the public health department of a nation that assumes a priority in civilisation, intelligence, and religion, says, at the conclusion of

a searching and authorised investigation, "Nothing in the course of the present inquiry has given an inkling of support to a rather prevalent notion that some perfect scheme of excrement disposal, applicable to all sorts of places irrespectively, may be looked for, and action properly deferred until such scheme be forthcoming."*

Of so little practical economic value, in a matter the most elementary, affecting universally, both as to time and space, life and health, are the combined influences of history, science, and civilisation!

Whatever difference of view there may be as to the supernatural element in the book which is said to be the "foundation of England's greatness," it is admitted on all hands that Moses was a lawgiver who has been unsurpassed; and the still surviving race for which he legislated are, and have been, through the procession of ages, monuments of his social wisdom.

It has been the practice of Western teachers of law and religion to concern themselves about things more glorious than the safe arrangement of the excremental process. The word "typhoid," in its definition and history, now so well and generally understood, has been the talisman that has awakened statesmen and philanthropists to a knowledge of their error. Preventible diseases are now honoured by being recognised as national adversaries; and it is at last beginning to be considered to be as glorious to save lives at home as it has always been to save them on the field of battle.

Yet Moses gave to his people, and through them to the world and to all subsequent time, the leading principles which safely control the discharge of this essential and unavoidable function.† The principles are, instantaneous removal, combined with instantaneous disinfection.

I would blend the principles into one still more general and elementary, a violation of which, by anyone and anywhere, inevitably involves us in peril and in nuisance; a violation of which, therefore, should be defined, and dealt with always as a statutable offence.

The elementary principle I would enunciate is, that excrement once voided should be instaneously dealt with. To leave it to pollute the common air is a crime against the State and a sin against nature. Such a course indicates a criminal inconsiderateness in the offender, and is an undefinable but not less certain source of injury to others.

In the system of water-carriage, excrement is instantaneously dealt with by means of removal. In the tub or pail or pit, it should be as promptly dealt with by the absorbent ashes, or the more disinfecting dry earth.

In the latter system—I mean the dry system—automatic contrivances are not essential. Trouble must be incurred in some part of the process; and dirty and inconsiderate people will foul and spoil the best arrangements. Such persons must undergo a course of correction and education.

My assertion, therefore, is this: that excrement deposited and undealt with is always and everywhere an injurious nuisance, and should be dealt with accordingly. It matters not whether it be a single deposit in a street, or a pot retained in a dwelling, or a pit or a pailful in a curtilage, it must compulsorily be dealt with by removal, as by water; or be disinfected by earth or ashes, as in the dry system.

Whilst we are in agreement with the Inspectors of the Local Government Board, from whose report I have quoted, that no perfect dry system has been yet devised as universally applicable, we are, therefore, bound, I think, to proceed tentatively and inexpensively in any changes which we may oblige people to make with our present knowledge. But something is gained by having a fixed principle clearly defined, and by making all our changes, costly or otherwise, in accordance therewith.

It may be thought how destitute the rural district of the Cockermouth Union was of sanitary conveniences, when I say that 581 new privies have been built, under the direction of the authority, in five years, in a population of about 25,000 persons.

They have been erected after the simplest model, fitted with pails; and the only requisition in regard to them was, that a specially devised or other sifter should be used, by means of which the ashes from the hearth should be daily sifted upon the night-soil.

The result of the requisition is obviously to give complete simplicity to the action of householders, and to the report of Inspectors. In the present state of the law, it is a matter of undefined opinion whether a privy is a nuisance or not, and thus amenable to the correction of the law. But under the Cockermouth system, the report of the Inspector refers only to the fact whether or not the excreta are exposed, or the ashes in their proper place, namely, upon the excreta. The same simplicity is afforded in the directions given to house occupiers.

I can only testify that working people in that district are now ashamed when any offence of the kind I have mentioned can be charged against them; and to the action of so simple a requisition, gradually enforced through a period of five years, I ascribe in great measure the fact that in the year 1877 not a single adult, male or female, in the entire sanitary district, died from any of the list of zymotic complaints, which had been very fatal in the district in former years.

The addition to the 40th section of the Act, which I would suggest would be a definition that a privy was a nuisance, and to be reported and dealt with as such, when the excrement was not removed or covered in the manner indicated in the paper.

ON THE TREATMENT OF TOWN SEWAGE WITH REFERENCE TO THE HEALTH OF THE POPULATION, AND ESPECIALLY OF THAT PORTION OF THE SEWAGE WHICH IS KNOWN AS "HUMAN EXCRETA."

By Edwin Chesshire.

The paper which I shall have the honour of reading to you, at the solicitation of the Council of this Society, and at the recommendation of the Local Government Board, will be on the treatment of "town sewage" with reference to the health of the population. I shall, however, especially allude to that portion of the "sewage" which is

* Report of the Medical Officer to the Privy Council and Local Government Board, New Series, No. 1, page 141.
† Deut. xxiii., v. 12, 13, 14.

known as "human excreta." *En passant*, I should wish to say, when I use the term "sewage," I shall mean the contents of the sewers, of whatever materials those contents may be composed; when I use the term "excreta," I shall mean the excreta of the population. It has been customary, even among scientific men—why, it is impossible to define—to speak of human excreta as "sewage;" and we frequently hear of the sewage of so many persons. Such a term is evidently a misnomer, as human beings certainly do not void sewage; such a term, too, is calculated to mislead us in the discussion and solution of the "sewage problem," a problem which is always difficult and intricate enough; still, great and intricate as that difficulty is, it has been created within the past half-century by the introduction of the underground water-closet cesspool system, and by the very men who are now seeking its removal—I mean the corporate bodies and local boards. I shall begin where every one should begin who desires thoroughly to ventilate his subject, where the difficulty starts from, and where its evils are most severely felt. I mean at the beginning, and I shall proceed to discuss the question as it affects the sanitary condition of the urban population. The insanitary evils which have occurred to the health of the population by the introduction of underground or subterranean drainage are incalculable, and call for a prompt and effective remedy; those evils, however, would never have arisen, even from underground drainage, had the drains been used for their legitimate and proper purposes—I mean for the conveyance of liquids only. When an architect designs the plan of a house, he takes the greatest care, by means of traps and gratings, to prevent any solid matter entering the drains; but when he attempts to deal with the water-closet soil, strange as it may appear, he allows all the fæcal matter, viscid and tenacious as that substance is, all the paper, hair, dish-cloths, and other solid matters which are put down water-closets, to pass through the closet soil-pipe into the same system of drains, in the hope that the rainfall will come to his assistance and remove them. As far as he is able, he takes care, by connecting the roof water with the drains through the spouts, and the surface water through the gratings, to remove by water pressure this filthy mass from the house-drains. But, unfortunately for him, as it always has been and ever will be for sewage utilisers of the modern school, the rainfall is very capricious and irregular: it may not put in an appearance for a fortnight, or even for a month, during which time the collection of fæcal matter in the house drains is enormous. In this great metropolis I estimate during dry weather in one week that about 1,200 tons of fæcal matter are collected in the house drains, or about one ounce and a half per head of the population per day. In those drains this collection of filth undergoes putrefaction and decomposition, generating sulphuretted and phosphoretted hydrogen and other foul gases, known as sewer or sewage gases; and it is those gases which so freely and so continually escape into the interior of houses through the various water-closets, sinks, lavatories, and waste-pipes. My late distinguished friend, Dr. Edmund Parkes, took great interest in my views on sewage disposal and utilisation; and I have a very lively recollection of the many agreeable visits with which he favoured me at my rooms in Birmingham. In reference to my plan, page 328, in his great work on "Practical Hygiene," after describing the construction of my sanitary interceptor, Dr. Parkes says the box is hermetically sealed, and trapped above and below; the result of this, he says, is that the urine runs off through the discharge-pipe, leaving the solid in the box; from time to time the solid is removed and the box cleaned out. Dr. Parkes says decomposition of the solid soil is certainly greatly delayed if not altogether arrested in this way. Many instances have been recorded, such as the propagation of Asiatic cholera by the celebrated Broad-street pump, an epidemic in Scotland, and the sudden and severe outbreak of typhoid in barracks at Munich, where the drinking water, polluted by percolation from sewers, drains, and middens, was made the medium by which the fever was propagated. Dr. Parkes says this medium of propagation has been admitted by men who have paid special attention to this subject, as Jenner, Budd, and Simon. Again, says Dr. Parkes, speaking of sewer gas, the diseases produced by fæcal emanations in the general population, seem to be diarrhœa, bilious disorders, often with febrile symptoms, dyspepsia, general malaise, anæmia. Typhoid fever is also intimately connected with sewage emanations, and, in addition, he says sewage air aggravates most decidedly the severity of all the exanthemata, erysipelas, hospital gangrene, and puerperal fever, and probably it has an injurious effect in all other cases. So long as the solid portion of the excreta from water-closets is cast into the drains—unless an arrangement can be made with the heavens to give us a continuous, or, at all events, a constantly repeated rainfall, so that the house-drains may always be effectually flushed—so long will those insanitary evils continue; but if the solid portion of the excreta were intercepted and retained in sealed iron boxes—sanitary interceptors—as I have suggested, the drains and sewers, as well as the rivers into which the sewage flows, would be relieved from pollution to a remarkable extent, the foul gases would no longer be generated, and the solid portion of the excreta would be put into a concentrated and portable form for utilisation, while the urine and other liquids would flow freely and continually away, to be dealt with at the sewer's outfall by subsidence and filtration, and ultimately, when clarified, to be applied to the land by intermittent downward filtration and irrigation, as I have so strongly and so frequently recommended. If we could imagine a section horizontally made under London, such section to pass through the house-drains, and if it were possible to lift up the upper portion of the section, we should witness a most revolting sight, and the residents of this great city would at once be made acquainted with the melancholy fact that they were living over, and almost in the midst of, a vast series or network of cesspools of the vilest description, more vile and more insanitary even than the old middens; bad as those middens were, those nasty receptacles were placed outside the houses, whereas the underground, elongated cesspools of the modern kind are almost in direct communication with the interior of dwelling-houses. It

is not in the main sewers where the insanitary evils exist, for when the solid portion of the excreta of the population gets into those channels, provided they are sufficiently capacious, and are constructed with a sufficient fall, that material under the influence of the rainfall escapes quickly into the rivers, either through the storm outlets or the sewers' outfalls, where it pollutes and contaminates the rivers. Sometimes, however, cases occur, as recently happened at Brixton, where the main sewers were incapable of taking the soupy or slushy sewage which had to pass through them, by which regurgitation of filth into the streets and houses took place, but had the solid portion of the excreta of the population, and as far as practicable other solids also, been intercepted at the fountain-head, or at the starting-point in sanitary interceptors, the only point where interception is possible, the same main sewer which now refuses to permit the passage of the sewage, composed as it is of so much solid matter, would admit of its free escape, if liquids only formed the sewage; moreover, if liquids only were allowed to escape into the drain, such liquids would continually flow away, and no clogging of the drains would take place, and as there would then be no decomposition, no foul gas would be generated. Johnson tells us, that a sewer is a passage for fluid, which is an excellent definition of the word. In consequence of the inhalations of sewer gas by the residents, blood-poisoning is constantly going on amongst the urban population, by which the vital powers are depressed and rendered unfit to cope with disease; hence it is that in an acute inflammation of any of the vital organs the tendency is to collapse—a circumstance which makes medical practitioners alive to the necessity of an early administration of stimulants to sustain life, and though such cases may not be true typhoid, the symptoms which cause death are very analogous to that disease. Many are the deaths now recorded as pneumonia, bronchitis, &c., which should be entered as typhoid; but the death-rate practically is no criterion of the healthiness of a city; the first thing to be ascertained before a satisfactory opinion can be formed as to the salubrity of any particular locality, is the relative proportion of children in the population. In this city, for instance, during the last five-and-thirty years, thousands of residents have removed into suburban districts, and have placed an elderly couple without a family either at the bank, the office, the shop, or the warehouse, as care-takers, while they have taken their children from London, where the death-rate should have been decreased, into the country, where the death-rate should have been proportionately increased, in consequence of the addition to the number of children in proportion to the adult population. At the Social Science meeting at Edinburgh, Dr. Christison, the president of the "Health" Section, told his hearers that there was a new disease in that city, a disease, said he, which is called typhoid or gastric fever; but, strange to say, it does not attack the houses of the poor where the ventilation is bad and the drainage imperfect; "but," said Dr. Christison, "it effects the houses of the rich, where the drainage is good and the ventilation excellent;" in truth, it affected those houses, and those houses alone, which were connected with the sewers, "the houses of the rich." In the report of Mr. J. N. Radcliffe to the Privy Council, it is stated that excrement-sodden earth, excrement-polluted air, and excrement-polluted water, are the principal factors in the product of diarrhœa and gastric fever, and that the condition chiefly productive of these diseases exists in its most dangerous form in improperly constructed and arranged, and imperfectly acting or stagnant sewers containing excrement.

Other instances equally strong have been reported, such as the epidemic of typhoid fever in the Cloisters of Westminster, where, says Mr. Simon, in those houses which were in communication with the sewers, the fever prevailed, whilst, in not one of those which were unconnected with the sewers, though in other respects their construction was inferior, did a single case occur. In Birmingham, where I am thoroughly familiar with the condition of things, when the Sewage Committee was appointed, that committee sought and obtained the advice of my own profession, and in every instance, I believe, on sanitary grounds, the members of that profession said "don't put the excreta into the sewers;" the committee itself, too, throughout the whole of its report, expressed the same views very strongly, yet, strange as it may appear, this committee has continued ever since to permit and even to encourage the escape of the water-closet soil through the drains and sewers; the consequence is, they (the committee) have utterly failed either in improving the sanitary condition of the borough (the average duration of human life in that town during the last two years being under 22 years), nor have they succeeded in utilising the excreta of the population, nor in freeing the River Tame from pollution in the smallest degree, a nuisance of which Lord Norton has so often and so justly complained. I am myself an unfortunate resident on the banks of the same river, lower down the polluted stream than Hams Hall, the seat of the noble lord; still, I have to complain very much of the foul emanations from the river. Prior to 1827, I believe it was, typhoid fever was an unknown disease in this country; Asiatic cholera and diphtheria are later importations; but those diseases, as well as diarrhœa and other affections of the alimentary canal, as I have before stated, are mainly, if not entirely, propagated through the medium of the bowel secretions, either in the atmosphere we breathe, or in the water we drink. The condition of the drainage of Marlborough-house, of the War-office, and even of the Local Government-office, is most unsatisfactory; in the latter building, though the drains are of modern construction and of the most costly description, the *Lancet* has devoted several articles to the consideration of the insanitary condition of that place, in consequence of the state of the drains. We have had many instances of typhoid attacks amongst illustrious persons owing to this cause, some of them unfortunately fatal. Dr. Edward Smith, medical officer of the Poor-law Board, in his "Handbook for Inspectors of Nuisances," page 162, says, "Mr. Chesshire, of Birmingham, has devised an ingenious arrangement by which the urine is separated from the fæces, and the solid part allowed to remain and

accumulate until the box is full. It is so constructed that it may be applied either to a common privy in lieu of an aspect, or to a water-closet at some point intermediate between the seat and the sewer, catching the excreta of the household and retaining the solid or valuable portion in a portable form, while the liquid passes away into the sewer, and the drains remain perfectly clean."

Soon after the adoption of the water-closet system in its entirety in this metropolis—the Act was obtained, I believe, in 1844—the River Thames became polluted, the fish were destroyed, and the river itself was converted into an open sewer; and although the new drainage scheme, which has cost so many millions, has transferred the sewage from a point above to a point below London-bridge, it has left the metropolis itself riddled as it were by a vast series or network of underground elongated cesspools from end to end.

DISCHARGE OF SEWAGE INTO THE SEA.

By Henry Robinson, C.E.

A very general impression prevails that if a town is situated close to the sea it is necessarily in a more advantageous position than inland towns, respecting the disposal of its sewage, as it has only to avail itself of its proximity to the sea to get rid of its sewage by discharging into it. That this is an erroneous impression the experience of most of our watering places proves, and it is therefore desirable to offer a caution to those who are contemplating adopting a similar course. In the Local Government Board Blue-book of 1876, one of the conclusions arrived at is as follows:—"That towns, situate on the sea coast, or on tidal estuaries, may be allowed to turn sewage into the sea or estuary, below the line of low water, provided no nuisance is caused; and that such mode of getting rid of sewage may be allowed and justified on the score of economy." This has been often quoted as encouraging the adoption of this method of sewage disposal, and it is to be regretted that the report gives no data whatever (such as are abundantly available) by which the qualifying expression, "provided no nuisance is caused," would be shown to apply to a great number, if not the majority of cases. It might have been stated that, to avoid a nuisance, the sewage must be discharged into the sea at a point not only below low water, but where there is a well-ascertained current which would carry it permanently seaward. A point of discharge complying with these conditions is but seldom found to exist close to the town, but has to be reached by long and costly outfall sewers, or rather tunnels. At the outfalls there should be a continuous movement seaward during the 24 hours, instead of an oscillating action to and fro, resulting in a return of the sewage and its deposition along the shore, not only at the outfall and in its immediate neighbourhood, but also at distant places to which the tide carries. The writer has had occasion to inspect many watering places where the foreshore is being distinctly polluted in this way. At first the mischief is not great, and only traces of the sewage are visible; but in time it becomes serious, and the knowledge of the existence of sewage pollution on the foreshore causes the place to be avoided by those who hitherto have resorted to it. The grievance is not a merely sentimental one, as the exhalations along the foreshore from sewage accretions at low tide involve not only offensive smells, but also a danger to health.

The difficulties attending the discharge of sewage into the sea would be diminished were it not that it has a higher temperature and a lower specific gravity than sea or river water, which causes it to rise to the surface; and if it is not carried seaward at once, part of the suspended solid impurities are deposited on the coast wherever there is still water and no tidal current, whilst the rest of the suspended, together with the dissolved, impurities float on the surface, and are carried backwards and forwards by every tide, decomposing and liberating gases (sulphuretted hydrogen being one of the most offensive) injurious to health and polluting the air.

In some cases, by means of long outfall sewers, the sewage is carried clear away from the place producing it, as at Brighton. These practically become elongated cesspools, in which noxious gases are generated, and are liable to be forced back into the town drains, and thence into the houses. In these long outfalls, also, the solids deposit and involve both expense and difficulty to remove. Even if the places producing the sewage really get rid of it in this way, they are frequently simply transferring it to others, a set of the tide carrying it so as to cause mischief and nuisance elsewhere. No better illustration of this can be given than the experience of Margate. The authorities there proposed, after much competition amongst rival engineers, to adopt a scheme by which the sewage was to be discharged into the sea in a bay about a mile and a half eastward of the town, where it turned out that there was practically no current seaward, so that, had the scheme been carried out, the coast there would have been permanently polluted, as the sewage would have risen and dropped with the tide, evolving all kinds of dangerous and offensive gases, which would have effectually driven visitors away, and have depreciated to a serious extent the value of the neighbouring property. Ramsgate is in a similar difficulty, and many other places could be cited where it is a matter of serious concern how to deal with the sewage. The authorities are compelled to drain their towns, and the very effort they make to comply with the sanitary requirements of the day appears to involve them in almost greater difficulties. There is only one way safely of dealing with sewage at seaside places where the tidal currents are not clearly favourable, and that is, to deodorise the sewage before it is discharged into the sea.

The authorities of Glasgow have had the question of how to get rid of their sewage under consideration for a long while. A Royal Commission investigated this case, and although the result of this was to advise the adoption of a scheme to carry the sewage twenty-seven miles in a tunnel to the sea, at enormous cost, and although this advice was similar to that previously given, the authorities took the matter into their own hands, and appointed a committee of their body, which has recently presented an exceedingly able and interesting report, giving the results of their investigations. The conclusion they arrive at is not to adopt

the recommendations to discharge their sewage into the sea, but to discharge it into the River Clyde after it has been purified by chemical treatment.

Where there is a risk of nuisance, either to the place to be drained or to its neighbours (which is equally important), by discharging sewage into the sea, a clarification and deodorisation of the sewage can be easily and cheaply effected. No attempt to arrest the solids in catchment tanks can possibly be satisfactory, inasmuch as they only remove a very small portion of the solids, and become huge cesspools, which have to be cleared out at intervals, with a certainty of causing great nuisance. Filtration is also not admissible, as the filters soon get inoperative, and become in addition as great a nuisance as catchment tanks. By deodorising the sewage the first difficulty is overcome, as the sewage is no longer offensive.

There has hitherto been much prejudice against chemical treatment, which is, however, disappearing, as it has been abundantly proved that sewage can thereby be deprived of its offensive properties by simple and inexpensive means. The disposal of the semi-fluid sludge has been a difficulty which the writer has had to give much attention to, and he has employed several methods of converting it into a portable form. The plan which he has found the best is to remove a great part of the moisture from the sludge by means of a simple filter press. A model of this press (which is an automatic modification of an old construction of press) has been placed in the Exhibition of Sanitary Appliances. By an appliance of this kind, the sludge has the bulk of its water pressed out, and the consequent reduction both in mass and consistency enables the sludge to be better removed and utilised, or dealt with in any other way.

REMARKS ON THE COST OF SYSTEMS GIVEN IN THE LOCAL GOVERNMENT BOARD BLUE-BOOK ON SEWAGE.

By J. C Melliss, C.E.

In the year 1875, the Local Government Board appointed a committee to inquire into the several modes of treating town sewage, "the attention of the Board having for some time past been directed to the great difficulties experienced by sanitary authorities in devising means for the disposal of the sewage of their districts, and having regard to the frequent applications which are made to them for advice on this subject." In the following year this report was made, printed, and published. It was anxiously looked for by a very large majority of sanitary authorities, and therefore rapidly penetrated to all parts of the kingdom. The volume contains a vast amount of exceedingly valuable data collected at much trouble and expense, but the deductions drawn by the committee therefrom have not satisfied the public. They evidently do not afford that aid which was expected. The work of criticism is such an easy task, that I almost refrain from any comment; but being uninfluenced by any spirit of hostility, and guided only by a desire to see the Local Government Board continue the work which in this direction they have commenced, and by a wish to see sanitary authorities relieved from a condition of bewilderment, into which they still seem plunged as to the most economical mode of dealing with their sewage, I would make the following few general remarks.

The committee arrive at certain conclusions from the results of their labours; and conclusions 5, 7, and 8 are as follow:—

"5. That as far as we have been able to ascertain none of the existing modes of treating town sewage by deposition and by chemicals in tanks appear to effect much change beyond the separation of the solids, and the clarification of the liquid. That the treatment of sewage in this manner, however, effects a considerable improvement, and, when carried to its greatest perfection, may in some cases be accepted.

"7. That town sewage can best and most cheaply be disposed of and purified by the process of land irrigation for agricultural purposes, where local conditions are favourable to its application," &c.

"8. That land irrigation is not practicable in all cases, and therefore other modes of dealing with sewage must be allowed."

These constitute the pith of the conclusions, as far as they touch upon treatment of sewage by land irrigation and chemicals; and they are very generally interpreted to, and on the face of them do, favour the employment of the former method. A careful examination of the figures, as regards cost of treating sewage by land irrigation and by the employment of chemicals, given in the abstracts which accompany the report, pages xxxvii. to liv., however, will show plainly that in the majority of cases land irrigation is more costly than where chemicals are employed, so that in fact the data do not support the conclusions. This is a fact which perplexes sanitary authorities, and deters them from making progress, when desirous, as they naturally are, of obtaining what they require in the most economical way.

In reference to discharging sewage into the sea, conclusion 9 says:—

"Towns situate on the sea-coast or tidal estuaries may be allowed to turn sewage into the sea or estuary, below the line of low-water, provided no nuisance is caused," &c.

The report contains no data from places where sewage is so dealt with, and nothing to indicate to inquiring sea-side sanitary authorities that not only in some instances is such a method the most costly, but that in nine cases out of ten a nuisance will result.

Nearly two years have elapsed since this report was published. Its incompleteness has had the effect of encouraging local authorities in a policy of stagnation, and it does not appear that the Local Government Board have taken further steps in the matter. This is to be deeply regretted, as considering the very large sums of money that have been spent in dealing with sewage, and the large sums of money that must still be spent, the importance of the subject cannot possibly be overrated. Much useful information is being brought together by the Society of Arts as well as by private individuals, but the Local Government Board alone possesses the power to obtain full information on this subject. It therefore rests with that Department, either as at present constituted, or probably enlarged so as to grasp and deal with the enormous sanitary interests now committed to its care, to continue these inquiries, and without

any partiality to enlighten sanitary authorities, and through them the ratepayers, as to the best and most economical methods to be employed, and to define what are the general local conditions which would govern the selection of one system as preferable to another.

INTERMITTENT FILTRATION THROUGH NATURAL SOIL.

By J. Bailey Denton.

Seeing that under the eighth division of the programme of the proceedings of the Conference remarks are invited "upon the costs of systems given in the last report of the Local Government Board," by which is meant, I presume, the report of the committee appointed by Mr. Sclater-Booth to inquire into the different modes adopted for the disposal of sewage, and being aware that great misapprehension exists as to the cost of preparing land for intermittent filtration through natural soil, owing to the very extraordinary figures given without explanation in that report, in relation to Merthyr Tydfil and Kendal—in both which cases I designed the works—I think it right to state that it could only be by mixing up with the preparation of the land utilised, other works which ought to have been excluded, that such extravagant figures could have been arrived at.

In the interests of sanitary science, as well as in my own justification, I desire to show that, had the expenditure been fairly investigated, the figures to which I refer would not have reached half the cost per acre given in that report. This I propose to do by giving the precise cost of a similar work executed subsequently to those of Merthyr Tydfil and Kendal—that of Abingdon, which has now been completed and in operation nearly twelve months, and I append a statement prepared by my son, in which the details are given.

Abingdon is a favourable instance of intermittent filtration combined with surface irrigation, and illustrates what may be done in many instances in the Thames Valley and other valleys where suitable soils exist.

At Abingdon, 34 acres of land have been prepared—6½ for intermittent filtration, and 27½ for surface irrigation, and the total outlay, including delivering conduit (pipes) as well as chambers and distributing earth carriers, cart roads, barrow paths and fencing, wages of clerk of works, and charges of engineer, has not exceeded £2,550, or an average of £75 per acre. The cost of preparing the land for intermittent downward filtration did not reach £85 per acre, while that of preparing it for surface irrigation cost over £70 per acre, including in each case a proper proportion of attendant charges. The soil of Abingdon is not more suitable than that of Merthyr and Kendal, yet it will be seen that the actual cost is only about one-third of that represented in the report referred to as the case at Kendal.

The deduction to be gained from the mode of disposing of sewage at Abingdon is that where intermittent filtration through suitable soil, *per se*, is adopted, one acre to a thousand people is ample to secure a perfect effluent.

Description of Works and Outlay.

By E. F. Bailey Denton, B.A. Oxon.

Abingdon, the county town of Berkshire, is situated on the Thames, and is connected with the main line of the Great Western Railway by a branch. It has a population of a little above 6,000, and a rateable value of about £14,750. Geologically speaking, the town is situated on the Kimmeridge clay at its junction with the coral rag of the oolite. Its position is comparatively low, the surface of the lower portion of the town being very little above the level of the river, while the remainder rises so gradually as to render it necessary to lift the whole of the sewage.

A complete system of water-tight sewers has been carried out for the whole of the town, and the surface waters are excluded from them as far as possible, with arrangements for flushing from the Thames, Ock, &c., at intervals. The sewage is conveyed from the town to the land to which it is applied, by an outfall sewer, which is sufficiently capacious to hold any liquid admitted into it during the night, when the lifting of the sewage is discontinued.

The sewerage, including this outfall sewer, and engineer's charges, but excluding private sewer-connections, has been executed for £8,750.

At the mouth of the outfall sewer a pumping station is erected on the land purchased by the urban sanitary authority, fitted with two 8-horse-power engines, together with coal shed, &c., at a cost of £2,500. In this amount is included the fencing of the station yard and a weighing machine, which serves for the weighing of the coal consumed by the engines, as well as the produce of the sewaged land as sold. Both these sums, amounting to £11,250, include engineer's charges, clerk of works' wages, and incidental expenses, and if repaid in 30 years at 5 per cent. would represent an annual charge of £562 10s., or less than 9¼d. in the £ on the rateable value.

The cost of the coals, and the wages of the engineman, with proper allowance for sundries, amount to £150 a year, which is equal to 2½d. on the rateable value, making the whole charge for sewerage rather less than 11¾d. in the £.

The amount of sewage at present discharged is somewhat above 100,000 gallons daily, augmented on occasions of rainfall, and at those times when the flushing of the sewers takes place.

At present, however, the water supply to Abingdon is obtained from the rivers Thames and Ock, and from private wells, and the quantity of sewage proper is less than ordinary, but steps have been taken, and plans are already made, to provide a public supply for the town at an estimated cost of £7,250. When these works are executed a greater number of water-closets will be introduced, and the quantity of sewage will, doubtless, be increased.

The land selected for the cleansing of the sewage, and purchased by the urban authority, is distant half-a-mile from the town. The soil is a free drift lying upon the clay in which the subsoil water is now kept down by under-drainage to a level with the water in the river. Until the under-drainage was effected, the subsoil water would rise, after continued wet weather, to within a foot or two of the surface. The quantity of land pur-

chased by the urban sanitary authority for sewage treatment is between 48 and 49 acres, of which only 34 acres have been laid out for sewage treatment. The rest, consisting of river-side meadow, is let as accommodation land, but it will be available to receive the sewage when experience has proved that its utilisation can be profitably effected. The cost of the 48 acres, including tenants' compensation and all expenses, has been £7,260. The cost of preparing the 34 acres of land to cleanse the sewage has been £2,550, including the payments to engineer and clerk of works. This is equal to an average outlay of £75 per acre. Of the 34 acres composing the sewage farm, 6½ acres were laid out for intermittent filtration, and 27½ for surface irrigation, and the £2,550 covers not only the preparation of the land, but the making and metalling of cart-roads and barrow-paths for the removal of produce, &c., and the erection of iron fencing, together with pipe conduits and sluice chambers to all parts of the land, and the necessary distributing earth carriers. The cost, per acre, in preparing the filtration land, which is divided into five equal horizontal areas, including under-drainage and a proportion of all other expenses, was a little under £85 an acre, while the cost of laying out the land for surface irrigation, including its proportion of all other expenses, was as much over £70 an acre. Two areas out of the five serve as "the safety valve," and receive the whole of the sewage for a year when it is not wanted elsewhere.

Beyond the cost of preparing the land, the urban sanitary authority have erected a pair of cottages, one for the engineman, and the other for the farm bailiff, together with a small set of farm buildings, at a cost of £1,075, including engineer's charges, &c.

Thus the land and its preparation, with the two cottages and farm buildings, have cost the urban sanitary authority £10,885; but for this money they possess a small farm and steading, for which they could realise at any time about half the outlay if sold by auction. The farm is in the hands of the urban sanitary authority, but tenders for the renting of it with the sewage are being sought, and as 2½ acres of the filtration areas alone suffice to cleanse the sewage, and the occupier can utilise it as and when he wants it on other parts of the farm without any trouble whatever, and without any doubt as to purification, it may be fairly assumed that the future rent of the 48 acres will not be less than £250 a-year, and may very likely be more.

At Abingdon there is no separation of the "sludge" from the liquid before it is applied to the land for purification. Whatever passes the screens, and is raised by the pumps, is distributed over the surface when the sewage is used for irrigation, or by the furrows when it is used for filtration, and no difficulty whatever is experienced in either case, nor is any smell perceptible at a distance of 20 yards. So far from any difficulty or objection having been experienced from the retention of the "sludge" in the sewage, the farm bailiff complains that he has not sludge enough, but that the liquid is absorbed by the land too quickly. Two hours after the cessation of pumping, no sewage liquid is to be seen on the farm.

During the period in which the sewage has been applied, one area of land has sufficed to absorb for days together the whole of the 100,000 gallons lifted by the engines, and this has been the case without the least sign of the land having too much, and without producing any injurious effect upon the effluent. As already intimated, the arrangement now made is, that two out of the five areas laid out for intermittent filtration (or 2½ acres out of the 34) shall be always in reserve to receive and dispose of the sewage when it is not wanted on other parts of the farm. These two areas will continue to act as the safety valve during the year 1878, after which period two other areas will take their place (for 1879), and so on.

The effluent water discharged by the under drains from the sewage land has been analysed by both Dr. Tidy and Dr. Woodforde. Dr. Tidy says of it, that it "was in every respect excellent. The quantity of common salt was not more than four grains per gallon, and it was perfectly clean and bright when run in large bulk;" and Dr. Woodforde states, that his analyses showed that the quantity of albuminoid ammonia which the effluent contained was not more than double that contained in London drinking water, while its condition generally was far superior to that of certain shallow wells at present used for domestic purposes in Abingdon.

WHETHER ANY FURTHER LEGISLATION OF A COMPULSORY OR PERMISSIVE CHARACTER IS NEEDED FOR BRINGING ABOUT A BETTER SANITARY CONDITION OF TOWNS OR DWELLINGS?

By Henry Robinson, C.E.

Those who have had much experience in advising local sanitary authorities will agree that the Public Health Act of 1875 is not accomplishing, to the extent that it is capable of, much improvement in the sanitary condition of the smaller towns, and of the rural population; so far, at least, as relates to questions of drainage and water supply, with which subjects the writer has been more directly concerned.

At a time like the present, when it is proposed to amend the Act, which implies that its provisions are unequal to the sanitary requirements of the country, it may be useful to consider whether the unsatisfactory outcome of the operations of this Act is due to defects in the Act itself, or whether it arises from neglect and obstructiveness on the part of the local authorities, or from inefficient administration at the Local Government Board.

The Public Health Act of 1875 gives the Local Government Board abundant power to compel reluctant local authorities to improve whatever is defective in either their drainage or water supply. Clauses 293 to 304 inclusive define these powers, and it is difficult to conceive that these clauses were not intended to be put in force by the Local Government Board itself. Experience, however, shows that these powers practically lie dormant, and no initiative is taken to set them in motion; in fact, until an epidemic breaks out, it may be safely stated that, in the majority of cases, the local authority takes no serious step towards discharging the duty imposed by the Act, by inquiring into the sanitary necessities of their districts

as to drainage and water supply, nor does the Local Government Board interfere to see that this duty is not left unperformed, although one important duty of this department is regarded by the public as consisting in keeping sanitary authorities up to their work.

The sanitary authority is frequently so constituted, that those members of it who take an interest in, and recognise the duty imposed on them as to, sanitary improvements, are opposed by a majority who are openly elected to keep down the rates, and who obstruct all efforts to carry out the requirements of their district. There is no real obligation on the authority to comply with the obvious intention of the Legislature that it shall ascertain what are the pressing wants of its district, and shall adopt such measures as the case requires, as it is known that nothing of a compulsory nature will be done unless the attention of the Local Government Board is drawn to the place by neglect or indifference having been carried so far that an epidemic breaks out.

In every case the local authority is tempted to do nothing, unless under strong pressure, which the medical officer or inspector of nuisances is expected by the Act mainly to be the means of exercising. If they do their duty it is under great disadvantages, as their appointment is dependent on the pleasure of those whom they are expected to influence, to the extent, even, of bringing the powers of the Local Government Board into operation, thus naturally entailing a hostile feeling against themselves.

Clause 299 of the Public Health Act of 1875 says:—

"Where complaint is made to the Local Government Board that a local authority has made default in providing their district with sufficient sewers, or in the maintenance of existing sewers, or in providing their districts with a supply of water, in cases where danger arises to the health of the inhabitants from the insufficiency or unwholesomeness of the existing supply of water *and a proper supply can be got at a reasonable cost* (the italics are the writers), or that a local authority has made default in enforcing any provisions of this Act which it is their duty to enforce, the Local Government Board, if satisfied after due inquiry that the authority has been guilty of the alleged default, shall make an order limiting the time for the performance of their duty in the matter of such complaint."

It will be noticed that, before any complaint can be justified as to the water supply being dangerous to health, the authority has to be convinced that a supply of pure water can be got, and at a reasonable cost. This involves both medical and engineering knowledge, and the authority, when disinclined to move, can, and invariably does, raise difficulties by which the evils are left, without any effort to remedy them, until an epidemic sacrifices a sufficient number of lives to bring down the authority the Local Government Board. It was stated by Dr. Frankland, F.R.S., last March, before the Select Committee to amend the Public Health Act, that about 12,000,000 people in this country derive their water from shallow wells, the water being "generally unwholesome; it is largely polluted with sewage, and, in fact, it may be stated generally that, as a rule, the rural population amongst whom we went were substantially drinking their own excrement." It was also stated by the chairman of that committee, and concurred in by Dr. Frankland, that typhoid fever is on the increase in this country.

Having in view the admittedly dangerous condition of so large a population, it would not be thought that any amendment of the Public Health Act of 1875 would have been satisfactory, which did not strike at the root of the evil, and present the possibility of the continuance of local obstructiveness or of passive acquiescence at head quarters. The Public Health Amendment Bill, as amended by the Select Committee, deals with the question of an improved water supply, and states in the preamble:—

"Whereas the provisions of the Public Health Act, 1875, are inadequate to secure a proper and sufficient supply of water, especially in rural sanitary districts, and it is accordingly expedient that these provisions be amended."

Clause 2 states: "It should be the duty of every rural sanitary authority to see that every occupied house within their district has, within a reasonable distance, a supply of wholesome water sufficient for the consumption and use for domestic purposes of the occupiers of the house."

"Where it appears to a rural sanitary authority, on the report of their inspector of nuisances, or their medical officer of health, that any occupied house within their district has not such supply within a reasonable distance, and the authority are of opinion that such supply can be provided at a reasonable cost, not exceeding a capital, the interest on which, at the rate of 5 per centum per annum, would amount to twopence per week, or at such other cost as the Local Government Board may, on the application of the local authority, determine under all the circumstances of the case, to be reasonable, and that the expense of providing the supply ought to be paid by the owner or made a private improvement expense."

It will be seen from these clauses that there remains the same opening for obstructiveness or indifference as in the past, and although many new and useful provisions are included in the Bill, which would remove some difficulties, the main point is still not gained, clause 2 leaving things practically as they are as regards bringing into operation the means of enforcing the provisions of the Bill. After the inspector of nuisances, or the medical officer, has reported to the authority, it has first to consider whether the alleged want of wholesome water is well founded; secondly, as to the reasonableness of the distance from a supply of wholesome water; and then as to the reasonableness of the cost of supplying the pure water to the inhabitants. Until all these conditions are clearly brought home to the minds of the authority, the inhabitants are left to continue to drink their foul water, and typhoid fever is left to claim its increasing number of victims.

The remedy, in the writer's opinion, is to leave less to the initiation of the local authority, and to require the Local Government Board (by further legislation, if such is needed) in the future to see that the Act is carried out in reality. Also in order to provide a remedy against the local officer being dependent on the authority, there should be a central medical (or other) officer appointed, having authority over the district, to whom the local medical officer, or nuisance inspector, should report (besides reporting to the authority), and that this chief officer should have power to act in cases of

emergency, and where the public health is jeopardised, without previously obtaining the consent of the sanitary authority, of whom he would be independent.

Clause 293 of the Public Health Act of 1875, already gives the Local Government Board power to interfere, if it were only acted on. The clause is this:—

"The Local Government Board may from time to time cause to be made such inquiries as are directed by this Act, *and such inquiries as they see fit in relation to any matter concerning the public health in any place*, or any matters with respect to which their sanction, approval, or consent is required by the Act."

The italics are the writer's, and it is difficult to propose words which could give wider powers to the department, if they were only put in force, which they are not.

The President of the Local Government Board stated in the House of Commons, this Session, that recent legislation on the subject had scarcely yet been allowed time to work, and that he saw no reason at present to seek for further compulsory powers on behalf of his department in reference to local authorities. It is to be hoped that a discussion at this Conference will tend to make the existing compulsory provisions of the Public Health Act operative, and to even increase them by the Amendment Bill (not, however, as non-drawn) to the fullest possible extent, as the time has arrived for the adoption of strong measures.

THE NECESSITY FOR LEGISLATION EMPOWERING URBAN SANITARY AUTHORITIES, TO PREVENT THE PROPRIETORS OF HOUSES ERECTED BEFORE THE CONSTITUTION OF LOCAL BOARDS, FROM BUILDING UPON THE WHOLE OF THE OPEN SPACE BELONGING TO SUCH HOUSES.

By Henry J. Yeld, M.D., F.C.S.,

Medical Officer of Health, Sunderland.

The Corporation of the borough of Sunderland, in 1866, anticipated the Artisans' Dwellings Act of 1875, by obtaining an Act of Parliament, enabling it, by an improvement scheme, to deal with a large amount of old property, which, from various causes, was unfit for human habitation.

The Town Council has spent some £80,000 upon that scheme, by means of which all the old fever dens, close lanes, and alleys, have been swept away. New, broad streets have been made, improved dwellings built, and the death-rate of that portion of the borough reduced from 30 to 22 per 1,000.

The Artisans' Dwellings Act of 1875 gives power to urban sanitary authorities to deal with a class of property in other large towns, similar to that dealt with under the provisions of the Sunderland Town Improvement Bill, and the results likely to be obtained, by the carrying out of that Act, cannot but be of immense advantage to the public welfare in every respect. At the same time, a new source of danger to the public health is likely to be produced, unless that portion of the Public Health Act of 1875, relating to the erection of new buildings, is either altered or amended.

This new source of danger is not an imaginary one, but one which, I think, should be carefully considered and, if possible, prevented; it is this:—

That whilst every facility is now given to local authorities by the Legislature for dealing with properties which, by reason of want of light, air, ventilation, and from other causes, are unfit for human habitation, and also for making bye-laws to regulate the building of new properties, in which provision can be made for a certain amount of space adjoining each house to be left for open-air space, no such provision is made whereby such authorities can deal with properties built before Local Boards were constituted; so that, unless some such provision be made, large sums of money may be spent on an improvement scheme in one part of a borough, whilst at the same time, in another portion of the same borough, a condition of things may be gradually coming into existence, similar, in many respects, to that which in the first instance made it necessary to put the Artisans' Dwellings Act into operation. These remarks apply more especially to municipal boroughs, incorporated within the last forty years.

In the borough of Sunderland, scarcely a Council meeting passes at which plans are not passed, allowing owners of property to build upon open spaces attached to properties built before the Corporation came into existence.

The local authority is at present powerless to prevent such additional building going on. Some few years ago the Council brought an action to test their power in this respect, when the verdict was given against them, it being held "That the building was not a new building within the meaning of the Act, but only an addition to an old building."

I think I have shown sufficient reason that it is at least desirable that some power should be given to local authorities, to prevent the whole of the open-air space belonging to old dwellings from being built upon. No doubt there are difficulties in the way of making laws or bye-laws which shall be retrospective in their operation; such difficulties, however, could be fairly met and overcome.

ON SOME DEFECTS IN THE PUBLIC HEALTH ACT AMENDMENT BILL, AS AMENDED BY THE SELECT COMMITTEE OF THE HOUSE OF COMMONS.

By F. T. Bond, M.D.

No one who has made himself acquainted with the details of the Public Health Act Amendment Bill, as altered in Committee, can fail to see that it is a measure of far greater public importance than its somewhat unobtrusive title would seem at first sight to indicate. It is not too much to say, that if the Bill becomes law during the present Session, and if the work which it foreshadows in rural districts can be carried out, it will do more to improve the condition of the poorer classes in these districts in respect to health, comfort, and decency than any enactment which the Legislature have passed for some time. Moreover, the Bill is an excellent illustration of the way in which the numerous defects and shortcomings of the Public Health Act may be dealt with in a practical way,

by taking special sections of it which relate to separate subjects, and making a careful inquiry into the legislative amendments which are needful and practicable in regard to them. Such amending Bills have a reasonable prospect of passing through Parliament, even when not undertaken by the Government, where a Ministerial measure for the amendment of the whole Act would have but a remote chance of success.

The machinery which the Public Health Act Amendment Bill—which it is only needful to say, relates chiefly to water supply—provides for the discovery of cases of insufficient supply of water in rural districts, and for the rectification of such defects where their existence is satisfactorily established, is excellent up to a certain point. The owner of a house which is not provided with a supply of drinkable water within reasonable distance, can be compelled by the sanitary authority to provide such a supply, if it can be obtained at a reasonable cost, or at one which represents the capitalised value, on an average, of the water-rate which such an owner can be obliged by the law at present to incur for a house where a system of public supply by pipes exists. The only remark which I have to make on this provision, is to express the hope that the President of the Local Government Board may look more favourably on it than he did three years ago, when Mr. Ernest Hart and I strongly pressed it on his attention in an interview which we had with him on the subject whilst the Public Health Act was passing through Parliament. He appeared at that time to view such a clause as equivalent to a confiscation of a large proportion of the cottage property in the country, and to think that it was not improbable that the House of Commons would sanction it.

The next step which a sanitary authority is empowered to take, is the natural sequel to the first, and has been evidently suggested by the provisions which the law at present makes in regard to allied matters, such as drainage and closet accommodation, viz., that where the owner of a house neglects or refuses to do the work which he is thus called upon to do, the sanitary authority may do it for him, and may either recover the cost from him by summary procedure, or may charge it upon the premises as a private improvement expense, for which the authority is empowered to levy a special rate. Now, it is at this point that it seems to me that a hitch is likely to occur in the working of the machinery created by the Bill. There is no doubt that there is a large number of cottages to which its provisions are applicable, which belong to owners who are worth the powder and shot of legal proceedings to recover the cost, which the sanitary authority may incur in remedying their default. In such cases the course of procedure will be very simple, and sanitary authorities will have no inducement to refrain from adopting it on account of either of the risk or the trouble in which it may involve them. But everyone who knows much of rural districts must be aware that a very large, possibly the largest, number of houses which will thus require the office of the sanitary authority to be promoted on their behalf, either belong to owners who are so utterly impecunious as to be unable to provide the means which will be necessary to carry out the works required by the sanitary authority, or their ownership is so tied up amongst several holders, with varying degrees of interest, that it is practically impossible to get them to do anything, and the sanitary authority must do it on their behalf.

Now, the first point which suggests itself here is to inquire whence the capital is to come, which will be required to pay for the works which sanitary authorities will thus have to carry out. The aggregate amount which will require to be spent in many rural districts within the course of the first two or three years after the passing of the Bill, if its provisions are to be put efficiently into force, will be very considerable, reaching, probably, in the case of large districts, to many hundreds of pounds. This money will have to be provided directly the works are commenced, so that they may be paid for, according to common practice, as soon as completed. On the other hand, the sanitary authority will, even under the most favourable circumstances, be unable to realise the cost of the works at once from the owners of the houses, and may have to stand out of it for two or three years.

So far as the Bill runs at present, there appears to be no alternative, but for the sanitary authority to raise the sums required for these works by rate. Now, although this rate will only be a temporary one, and although the amount raised by it would be eventually repaid, so that the district from which it is raised would not, in the long run, be at any loss from it, it is very desirable to avoid having recourse to it, if it be possible to do so, since the rural mind is much more ready to apprehend the mere intention of raising a rate, and to resent it, than to grasp the fact that such a rate would be only a loan on the part of the district to the owners of the property benefited.

There is, however, one provision which may be suggested as being calculated to meet this difficulty, and which might even create a desire on the part of sanitary authorities to carry out energetically the provisions of the Act, and that is, to enact that where the cost of the contemplated works is proposed to be defrayed by a private improvement rate, the sanitary authority may, in making the rate, add to the sum assessed on the premises for the repayment of the cost of the works, such additional sum as may be required to pay interest on the capital borrowed for carrying them out. At what rate such interest is to be estimated is a subject for discussion. It certainly should not be less than the sanitary authority would itself be required to pay if borrowing the money from the Public Loan Commissioners, or in the open market; and there are good reasons why it should be more. For, what is the reason for which this expenditure is required to be incurred? It is to remedy the *lâches* of the owners of property, who, by neglecting to do their duty towards their tenants, compel the sanitary authority to put pressure upon them to do so, at some trouble to itself, and at some expense to the other property owners in the district who have committed no such default. It is only fair, therefore, that if the money required in order to rectify these shortcomings of landlords has to be borrowed by rates imposed for a time on the other inhabitants of the district, the latter should be compensated by not only being paid the loan back in its entirety, but with such interest as

would cover use of the money itself, together with a contribution to the general expenses of the sanitary authority. If such an arrangement were made, and a landlord were required to pay, say six or seven per cent. on the cost of the works executed in thus improving his property, he would be no loser by the transaction, and the sanitary authority would be a distinct gainer. I believe that if this principle were extended to sanitary improvements of all kinds, *i.e.*, if sanitary authorities were empowered to themselves undertake works for the sanitary improvement of cottage property, and to charge private improvement rates, which would not only cover the cost of the improvement, but would leave a moderate margin for the benefit of the authority itself, a large field would be opened for the improvement of such property throughout the country, which both authorities and the owners of such property would be glad to cultivate.

The advantages of such an arrangement would be obvious. It would place local authorities in the same relative position with regard to the owners of property in their own district as the Public Loan Commissioners, representing the nation, now hold in regard to the authorities themselves by giving such owners the help of the general commercial credit of the authority upon which to borrow money for the sanitary improvement of their property, just as the authorities now avail themselves of the credit of the nation for the same end in regard to their schemes; with this important difference, that the sanitary authority, being on the spot, would be able to exercise a more efficient control over the expenditure of the money which it could lend than the Public Loan Commissioners can.

There is, however, another possible solution of this difficulty which may be suggested, and that is that the sanitary authority should be empowered to borrow the money required for carrying out these works directly from the Public Loan Commissioners—in the same way as it can do at present in the case of schemes of large extent. If this were done, it would, of course, be necessary that such loans should be applied for in lump sums, say of not less than £100 each, the re-payment of which would be chargeable on the rates of the contributory district as a whole, which would in its turn be recouped by the improvement rates levied on the property specially benefited. Such an arrangement would appear to be only a reasonable extension of the practice as referred to above, for it is difficult to see why if the owner of a house in a town is allowed to borrow, through the medium of the sanitary authority, from the nation at large, the capital required for supplying his house with water, as he can do at present, the owner of a similar house in the country should not, under similar conditions, be permitted to enjoy the same benefit.

The suggestions which I have made in the foregoing part of this paper refer primarily to the case of isolated cottages, or of small combinations of not more than two or three together belonging to one landlord; but their applicability becomes much stronger where the groups which require to be dealt with embrace some dozen or two houses, belonging, as is so often the case, to different owners. In such cases it would be only practicable to deal with the matter in one way, viz., for the sanitary authority to do the work, and to recover the cost by private improvement rate. So far as my own experience goes, the work which would require to be done under the Act would mainly come under this latter category. Now, in addition to the difficulty connected with raising the capital required for works constructed for supplying water to such groups of cottages, there is another, which does not seem to have suggested itself to the committee who have had the Public Health Act Amendment Bill under consideration, but which, I venture to think, will be found a rather serious one when it comes to be put into operation. It is this: in whom are works constructed by the sanitary authority (under section 2, subsection 5) for the common benefit of a group of houses belonging to different owners to be vested? As the Bill stands at present, the ownership of such works would be in common amongst the owners of the houses. A very little reflection will, however, convince anyone, I think, that such an arrangement would be a most unsatisfactory one. Wells require cleaning; pipes, pumps, and other mechanical contrivance, require constant looking after and mending. How can a heterogeneous body of landlords be expected to undertake such a duty? And if they fail to do it, as they certainly will in nine cases out of ten, what endless trouble will be entailed on the sanitary authority in making them do so! The simple remedy for this difficulty obviously is, to vest the custody, at any rate of all works constructed for the benefit in common of two or more houses, in the sanitary authority, and to empower it to levy on such houses such a rate as will be sufficient to cover the expense of providing for the proper maintenance of the works.

I believe that if the provisions which I have thus suggested were incorporated with the Bill, they would not only remedy defects in it which will, I fear, if not removed, greatly interfere with its practical success, but that they would make it a model on which to re-mould other portions of the Public Health Act, and thus greatly to facilitate the much-needed amendment of the Act.

ON TIDAL SEWAGE-OUTFALLS.

By James N. Shoolbred, Mem. Inst. C.E.

With a feeling of disappointment the writer perceived at last year's Sanitary Conference, held under the auspices of this Society, that there was no communication whatever upon this important branch of the sewage question. For it is one that, though so far it has drawn but little attention to itself, yet it is gradually forcing itself upon our attention, and is growing in importance; and from several reasons.

The subject of tidal outfalls, in the first instance, presents itself naturally to towns and cities situate, either upon the sea itself, or upon rivers affected by the tide. But, in proportion as the custodians, or conservators, of our large rivers become each day more stringent in preventing sewage and polluting matters from being poured into those streams, so will the authorities of the towns on the banks of the upper, or fresh water, portions of those streams have to look for other outlets for their sewage; at least, in its undiluted condition.

So that a time may come (though it is still in the distance) when one or more towns or districts on the fluvial portion of a river may combine, in order to carry away their sewage down to a point where it may be permitted to be discharged into the tideway, or into the open sea. Thus, some of our large rivers may come to have a sewage carrier along one, if not along both banks (as is the case in this metropolis), for a considerable distance down their course.

Again, several of the towns on the coast, such as Hastings, Brighton, Southport, and other watering-places, where it was essential to keep the shore free from all suspicion of pollution, have already constructed, at considerable expense, large intercepting conduits, to convey away to a distance the contents, which their original outlets emptied into the tideway directly in front of the localities themselves.

The controversy going on between the Thames Conservators and the Metropolitan Board of Works, as to deposits of sewage in the Thames in the neighbourhood of Woolwich, is a matter of notoriety; as is also the proposal to convey the sewage of Glasgow some distance away beyond the mouth of the Clyde, where it might flow direct into the open sea. The town of Dublin has also been crying out very warmly for some time back about the filthy condition of the Liffey; while the inhabitants of Liverpool and of Birkenhead have long complained of the fouling of the bathing places and sea-side resorts in the neighbourhood by slimy deposits of sewage; and their complaints are registered as far back as 1869, in the first volume of the Report of the River Pollution Commissioners.

For these and other reasons is this question of tidal outfalls for sewage gradually forcing itself, and in an unwelcome manner, upon our notice.

It is, therefore, not inopportune, that in this place and at this meeting, this branch of the sanitary question should begin to have its due consideration assigned to it, and an approximation, at least, arrived at as to the principles upon which those tidal outlets for sewage should be based. The radical error hitherto very generally made in the position of these outlets, and the cause of the costly intercepting culverts already referred to, has been due to a misconceived notion as to the action of the tide; to a confusion of ideas between the tidal impulse, which of course passes on never to return again; and the movement imparted by it to the water, and which is the result of the passage onward of this tidal impulse.

The particles of the water, successively finding themselves under the influence of this progressive force, start along in direction with it, and endeavour, but in vain, to keep pace with it. Gradually, as they lose the influence which has dragged them along with it, the force of gravity predominates with them, and they retrace their steps backwards, descending the inclined plane they had previously ascended, till they reach near to their original position, again to come under the influence of the succeeding tidal wave and be re-impelled forward once more. Hence the movement of the water under the tidal influence is one of constant oscillation; the length traversed being in the tidal rivers and shallow seas of our coasts more intensified and more marked than in the open ocean.

That the tidal impulse, or tidal wave, as it is more generally termed, and the movement of the water, its influence, are totally distinct from one another, may very readily be seen. A mere inspection of a map giving the times of high water along our coasts, or marking the cotidal lines, will show that the progress of the tidal wave, under ordinary circumstances, is at the rate of hundreds of miles per hour, while nowhere does the speed of the water, happily, exceed some six to seven, or eight, miles per hour.

From these remarks it will be seen that the discharged sewage, instead of being carried away never more to be heard of, as some had fondly hoped would be the case, becomes subjected to this oscillating action of the tidal water. Under this influence the solid portions, after a certain period, gradually are deposited in a slimy, gelatinous, disintegrated form in the quieter nooks and bays of the shore, somewhat removed from the more active part of the current. From this gradual deposition result the offensive smells, and thence the long and costly intercepting outfall conduits in the more fastidious and sensitive of our watering places. Similar results will undoubtedly follow elsewhere, and, therefore, some remedy or palliative should be sought for, in order to postpone at least, if not to prevent, similar disastrous effects.

The first and apparently the most natural precaution to take, to prevent these ill effects, lies in the selection of the position of the outlet mouth; which should, if possible, be into a part of the tideway, where the direction of the current is not parallel to the line of the coast, but somewhat deflected from it, so that the sewage in its oscillatory travels may not be brought back upon the shores whence it issued. But this, and numerous other circumstances, require in each case a special study of each individual locality; too long to be discussed here. Enough, however, has been said to show that this question of tidal sewage outfalls is one worthy of attention, and one which is daily growing in importance.

A river into which the tide enters, and which has populous towns upon its banks, situate upon the tidal as well as upon the fresh water portion of its course, becomes, with the prevailing system of water-carried sewage, itself a large sewage outlet into the sea. The magnitude of its fresh water current and the proportions the polluting matters bear to its waters depend very largely upon the area of the water-shed upon its rainfall, together with the geological and other physical conditions, or, in other words, upon the size and formation of the river basin belonging to it.

The Congress recently held here on National Water Supply have in their resolution requested, and apparently with much judgment, the Council of the Society of Arts to memorialise the Government to collect information on the subject of the sources of supply which are available, and to adhere to the river basin as the unit of classification for such information.

It would likewise appear, in the writer's opinion, to be equally fitting, that information as to that portion of the rainfall, which is polluted and rendered unfit for use by sewage and other matters, should also be collected, as a supplement to such water-source information, and like it should be arranged under the various water-shed areas.

TREATMENT AND DISPOSAL OF SEWAGE IN CHINA.

Her Majesty's Secretary of State for Foreign Affairs has been good enough to obtain, at the request of the Council, the following reports on the treatment and disposal of sewage in China:—

The Treatment and Disposal of Sewage in Peking.

Peking is fairly well supplied by water. In addition to the numerous surface wells within the walls of the city, the water of which is hard and charged, especially during the rainy season, with organic impurities, which percolate the porous sandy soil; there is an abundant supply of purer and softer water, derived from the springs and lakes of the vicinity of the summer palaces, situated at the foot of the western hills, some eight miles distant. A wide stream runs to the north-west angle of the city wall, where it opens out into a large reservoir, in which the water is confined by dams, the surplus supplying the city moat. From this reservoir the water is conducted by a canal which, after passing under the north wall, expands into several large lakes, from which proceed two canals which traverse the Tartar city. The Chinese city is similarly supplied by a small river, which flows from the Nan Haitzur, the vast southern hunting park, and ends in the moat. The water from these sources, after traversing the two cities, ultimately finds its way into the Tungchow Canal.

The sewers intersect the city in a rectangular network and open into the canals. The wide parallel streets have a large sewer on either side, into which open the smaller sewers from the lanes. The main sewers are square in section, of diameter sufficient to allow a man to crawl through them, and are constructed of large bricks, and covered with a layer of stone slabs. They are intended, principally, to carry off the flood of rain-water which inundates the city in July and August. This elaborate system, however, is all but useless, having long since fallen into ruin from decay and neglect. Some of the sewers project high above the level of the roadway, gradually worn down by traffic. All are chronically choked with animal and vegetable *débris*. It is the common practice of the inhabitants to remove one of the flagstones in front of their houses, and to throw in all the refuse, solid and fluid, so that the sewer becomes merely a focus of putrefaction. The putrid contents overflow into the streets after rain, and in dry weather are tapped for the purpose of watering the roads. In short, the sewers in their present condition are not only useless, but absolutely prejudicial to the public health.

The only detail of sanitary work which is at all efficiently performed is the removal of fæcal matters. The fluid excreta are either poured into the roadway or open sewer, or scattered over the street at sunset to lay the dust, but the solid excreta are most carefully collected, as in all other parts of China, for use as manure. They are removed entirely by the dry method. There are no cesspools in the houses, only a shallow hole lined with bricks, which is emptied daily by the scavenger. This is a regular business and means of livelihood in Chinese cities, and the man with a large wooden tub suspended on his back by means of a wide hoop passing over the shoulder, and a long-handled iron scoop in his hand, is a well-known figure in the streets. He does his work as a rule gratuitously, passing from house to house till his tub is full, when he carries it to dispose of the contents at one of the depots or manufactories. Another man wends his way along the public highway, where he also is able to pick up a fair livelihood, for the common Chinaman never scruples to halt by the way-side, even in broad daylight, and in full view of passers-by. The scavenger often digs holes in the ground of the more retired corners within his circuit for the convenience of the wayfarer and profit of himself.

The matters collected in this way are carried to one of the depots, whence they are conveyed outside the city in wheelbarrows, with a central wheel of large diameter, and on each side of the wheel a long coarse wicker basket, of the estimated capacity of two cwt. The wheelbarrow is driven by one man, who supports it with a yoke over his shoulders, and is assisted by one or more other men dragging with a rope in front. These baskets are quite open at the top and, being conveyed through the streets at all hours of the day, they are an insufferable nuisance. Within the walls of the city itself, moreover, there are not a few manufactories of manure, and, in fact, any large vacant piece of ground is usually utilised for this purpose. The excreta are first emptied into large holes dug in the ground, then spread over the surface in a layer about an inch thick, and constantly turned over with a spade until they become thoroughly dry. This process takes three or four days, the ground being dry and sandy, and the air remarkably free from moisture during ten months of the year. The manure, when dry, is piled into heaps, and sold retail by the small basket. A ton of this *poudrette* is estimated to sell for about sixteen shillings of our currency, which is the equivalent of a month's wages of a labouring man in this part of China.

It is a principle in native husbandry to apply manure to the plant rather than to the soil. The *poudrette* is sown with the seed or supplied to the root of the growing vegetable before irrigation.

In connection with this subject a condensed note on the comparative prevalence of certain diseases may be appended. Entozoa are very common in China. The natives scrupulously avoid drinking unboiled water, but on the other hand, they are fond of raw and half-cooked fruit and vegetables. An unusually large proportion of children come to hospital suffering from the presence of lumbrici. Tœnia is also often met with the result of the universal consumption of pork which is, besides, not infrequently infested with trichina. The pigs are allowed to wander through the streets, and foreign residents are obliged to refrain from native pork. Of zymotic diseases dysentery and diarrhœa are prevalent and especially dangerous after the rains, and appear to have direct relation with the amount of heat and moisture. Typhoid fever is a rare disease all over China-although typhus, diphtheria, scarlatina, &c., are ram, pant in the large cities. The rarity of typhoid may be directly due to the system of the removal of human excreta, preventing the contamination of water.

S. W. Bushell, B.Sc., M.D., Lon.
Univ. Scholar, Physician to
H.B.M. Legation.

Peking, 13th February, 1878.

Treatment of Sewage in Canton.

In all parts of the city of Canton there are public latrines erected, consisting of a number of compartments separated by a wooden partition. These are the property of the "Kai-foig," or street organisation, who, by the money derived from their rental, contrive to defray a considerable portion of the municipal expenses. The solid and liquid excreta collected separately from these receptacles, which are only used by men, are removed daily to the fields in baskets and buckets. The night-soil from private dwellings is carried away daily by women employed for the purpose, who empty and wash the utensils, and convey the matter to boats built specially for this object, by which it is taken into the agricultural districts, that from Canton going chiefly to the Tungkwan district. The solid excreta are usually partially dried before being

used as manure, and are occasionally mixed with ashes. Liquid manure is very largely employed for watering vegetables. Every country village has on its outskirts a pool or tank, on the banks of which latrines are built, and into which the sewage flows. In the winter the liquid is drained off, and the solid deposit at the bottom, which is rich in fertilising matter, is dried and used as manure.

The sewers in the city of Canton are cleared out triennially by the authorities, and the deposit carried off to the fields. But besides this the liquid black matter which collects is taken away from time to time, when considered sufficiently rich in fertilising matter to pay the cost of removal, by men who obtain access to the sewer by removing a stone from the pavement.

The foregoing is all the information I have been able to obtain upon the subject.

H. Hanbury,
H.M. Acting-Consul at Canton.

Canton, March 29th, 1878.

Treatment of Sewage in Foochow.

Sir,—In reply to your despatch, No. 1, of the 25th ultimo, on the subject of town sewage, I beg to offer the following information.

In the town and suburbs of Foochow there are drains under the main streets only, the side lanes being without; the scourings of the dyers and pulse makers, together with the waters and slops of dwellings and shops, compose a sewage of dark and rich consistency made up from the silting of the river tides which wash the drains. It is much sought after for the purpose of enriching ground set apart for rice cultivation in its natural state. There being none but public privies, human excrement is emptied into the street, and is fetched, in pails, from long distances in the country by gangs of men and women, and then cast into open pits lined with chunam until wanted for manure. When diluted with two-thirds of urine and water, the market gardeners sprinkle it over the cabbages. Millions of tubs of this description of manure are employed in this way to quicken the growth of vegetables, potash being in a few instances added to the composition. No part of this valuable manure is lost in sewers, while the cost of its transport into the country must be enormous.

There is not much difference in the method of manuring in any of the provinces south of the Yellow River.

C. A. Sinclair,
H.M. Consul at Foochow.

Foochow, February 28th 1878.

HEALTH AND SEWAGE OF TOWNS, 1878.

IRRIGATION.

The Act for preventing the pollution of rivers is but slowly coming into operation, and the difficulty is to find a remedy suitable to all cases and intelligible to Boards of Health. The report of the Health and Sewage Committee of the Society of Arts, in 1876, said, "It was conclusively shown that no one system for disposing of sewage could be adopted for universal use; that different localities require different methods, to suit their special peculiarities; and also that, as a rule, no profit can be derived at present from sewage utilisation." All experience confirms the truth of this. By degrees, opinions once confidently expressed by one authority are now questioned by another. Thus, the Royal Commissioners "on sewage of towns, and applying it to beneficial and profitable uses," said, in 1865, that "the right way to dispose of town sewage is to apply it *continuously* to land; and it is only by such application that the pollution of rivers can be avoided." This is quoted at p. 124 of the report of the Committee of the Local Government Board, of 1875. But this committee, with ten years' experience, state that "Land irrigation is not practicable in all cases, and, therefore, other modes of dealing with sewage must be allowed (p. xiii.). The *continuous* application of town sewage to all soils is by no means an unalloyed benefit, as in some cases and seasons, and especially upon dry land, it may be rather injurious than otherwise. Very few crops are actually benefited by the direct application of sewage upon a stiff and retentive soil; indeed, Italian rye grass, cabbage, and mangold wurzel seem to be the only farm crops that persistently flourish upon any soils, heavy or light, under continual doses of town sewage" (p. xxxii.). "The cultivation of sewaged land, for instance, requires more than double the amount of manual labour which is usually employed upon arable land, and more horses must be kept than upon an ordinary farm. To properly stock and work a sewage farm, upon which the main produce is consumed, quite five times the usual amount of money will be needed. One of the greatest difficulties is to keep the sewaged land clean, as not only does every weed and the minutest portion of a root-weed grow, but sewage itself often contains the seeds of numerous weeds which have been washed down from the fodder and straw of stables and cow-houses in towns" (p. xxxiii.). "We have also been assured by a gentleman of vast experience that the long-continued application of sewage to the same land fails to produce the like beneficial effect as when it was first used. It therefore appears most desirable that the application of sewage should occasionally be supplemented with some solid manure" (p. xxxvi.).

All the opinions of Mr. Rawlinson, Dr. Frankland, Dr. Voelcker, &c., confirm the conclusion that "no sewage should be put upon land without having been previously defecated in tanks."

The returns which the Committee of the Local Government Board published in 1876 do not enable any safe conclusions to be formed as to the comparative cost of using sewage on land. The following figures, referring to places having upwards of 20,000 inhabitants, may be studied with advantage. But every case should be examined on the spot, and accurate details of the facts obtained. Thus, in the case of Cheltenham, where the cost appears so exceptionally low, recently there have been public complaints that the sewage has been but very imperfectly used on the land, and sent away by water-courses. And it is thought that the system, although cheap, is nasty.

[WATER-CARRIED SEWAGE.]

Relative Costs of Systems of Treatment of Water-carried Sewage only, exclusive of cesspools, privies, &c., abstracted from the Local Government Report, made in 1876 (v. pp. xxxviii. to lvi.). *These figures are obviously open to correction, and can only be accepted as approximations.*

Towns having 20,000 persons and upwards in 1871.	Population.	Gallons daily.	Tons yearly.	Yearly loss.	Rateable Value.	Annual Cost in Pound on Rateable Value.	Nett Cost per Head.	Remarks.
			I.—Irrigation.					
				£	£	d.	s. d.	
Blackburn	90,000	1,500,000	2,444,040	7,661	235,127	7¼	1 8¼	
Cheltenham....	45,000	1,250,000	2,036,700	272	217,849	3/10	? 0 1½	Cheltenham.—These figures differ materially from those in Lord Rosebery's return, where the loss in given at £400.
Chorley	20,000	500,000	814,680	983	54,407	4	0 11½	
Doncaster	20,000	600,000	977,470	1,030	68,721	3½	1 0	
Leamington....	24,700	700,000	1,140,625	2,430	113,400	5	2 0	
Merthyr-Tydfil.	55,000	1,200,000	1,955,305	4,267	135,000	7½	1 6½	
Tunbridge Wells	23,000	650,000	1 059,230	5,987	142,914	10	5 2½	See Lord Rosebery's return.
Wolverhampton	71,000	2,500,000	4,073,400	? 1,634	210,000	2	0 5½	
West Derby ..	31,400	750,000	1,220,560	2,785	163,000	4¼	1 9	In 1877, the cost is stated at £6,330.
			II.—By Land Filtration.					
Kendal.....	13,700	750,000	1,222,098	747	44,600	4	1 1	See Society of Arts returns, 1877.
			III.—Precipitation in Tanks.					
Birmingham ..	350,000	12,000,000	19,553,415	21,930	1,229,844	4½	1 3	
			IV.—By Chemicals.					
Coventry	40,000	2,000,000	3,258,370	3,570	101,438	8½	1 8½	
Bolton-le-Moors	93,100	2,500,000	4,073,765	2,617	311,563	2	0 6	
Leeds	285,000	12,000,000	19,553,415	18,660	945,141	5	1 3¾	
Bradford	173,723	8,000,000	13,035,610	9,786	745,671	3	1 1¾	
Halifax.....	68,000	2,500,000	4,073,400	1,415	262,581	1¼	0 4½	See Society of Arts returns, 1877.
Totals	1,403,623	49,400,000	80,492,083	85,774	4,981,256	66¼	21 10¼	
Averages	87,726	3,087,500	5,030,755	5,360	311,328	4	1 4½	

RETURNS IN REPLY TO SCHEDULES.

The following is a summary of the returns furnished to the Committee by various towns and localities. They are intended to show the manner in which sewage is dealt with in each locality, and other particulars as far as they have been obtainable.

ALDERSHOT. — Population, 11,615. — Cesspools exist in the outlying districts, not allowed in the town proper, or in any position where a sewer exists within 100 feet of the premises. No bye-laws have yet been passed. The model bye-laws under consideration of the Board. Consider the only objection prohibiting construction of new middens and cesspools would be the great expense of making sewers for convenience of taking sewage away from isolated dwellings. The town is sewered, and as fast as it extends sewers are laid. Excreta are not mixed with ashes; few cesspools are in use, and those mostly in isolated districts, where people make use of the excreta for their land. In 1877, Hillé's system for precipitation adopted, and answers admirably.

BANGOR.—Population, 7,723.—Very few middens or cesspools. Water-closets in nearly general use, and a daily collection of ashes is made. Middens emptied by tenant or landlord, but at no stated period. No bye-law passed prohibiting use of middens or cesspools. Consider there would be no objection to passing a general law prohibiting the construction of new middens and cesspools; some Act of the kind is wanted, and in small towns situated as Bangor, might be done with public advantage at once. Tub and pail system not required here. Excreta not mixed with ashes. No new methods adopted in 1877.

BARNSLEY.—Population, 23,021.—Middens and cesspools still exist; emptied, when neccessary, by Corporation. Bye-laws have been passed; open middens no longer allowed to be built, and old ones are fast disappearing. Cesspools only allowed for detached houses more than 100 feet from a sewer. Barnsley been prohibited, by injunction, for the last four years, from constructing fresh sewers or discharging more sewage into the river, consequently the Corporation have had to permit cesspools. The injunction will be removed at Christmas, 1878, and then the use of cesspools will be prohibited. The objection to passing a general law to prohibit their construction would be on the ground of expense, they might be prohibited altogether within three years, except those more than a given distance, say 150 feet from a public road or street which ha a sewer. Tub and pail system not adopted; excreta are mixed with ashes. The Council have adopted a special form of closed privy and screen; the small ashes fall on and are mixed with the excreta, large ashes and other rubbish kept separate.

BARROW-IN-FURNESS.—Population, 41,000.—No middens and cesspools.

BASINGSTOKE.—Population, 5,574.—Urban sanitary authority are carrying out a thorough system of drainage, intended to supersede all middens and cesspools, which are at present very offensive.

BATH.—Population, 52,548.—No middens exist; cesspools only in such parts of the district as are not sewered. Almost all the district sewered. The outlying part not thickly built upon; has either water-tight cesspools or earth-closets, which are emptied by the owners as occasion requires. No bye-laws have been passed to prohibit use of cesspools. Consider a general law to prohibit construction of new middens and cesspools in this district useless. Earth-closets are allowed instead of water-closets, in the parts of districts where each house has plenty of garden ground, and ashes are there mixed with excreta. No new method has been adopted in 1877.

BEDFORD.—Population, 16,851; estimated now at 20,000.—Middens and cesspools do not exist; have a complete system of sewerage. Water-closet system adopted ten years ago.

BERWICK-UPON-TWEED.—Population 13,198.—Thoroughly drained and supplied with water; nearly every house has a water-closet; middens only allowed where there is a stable; cleaned out about once a month. In outlying districts forming portion of this sanitary district, middens and privies still exist. Urban sanitary authority are taking steps to adopt the model bye-laws of the Local Government Board. Consider there would be no objection to passing a general law prohibiting construction of new middens and cesspools in this locality, when Tweedmouth and Spital are sewered. No intention of adopting tub and pail system. In Tweedmouth and Spital all the house refuse is put into middens, with which the privies are connected, the contents being removed together. No new method adopted in 1877.

BLACKBURN.—Population, 80,000.—Middens and cesspools exist; emptied as often as required; varies according to size and numbers using them. No new cesspools or middens allowed by Corporation to be constructed. New cottages must have closets on pail system. This system has been adopted for some years, and old middens and privies are being converted to the pail system. Excreta and ashes mixed for sale only. Ashes are collected in separate tubs. No new method adopted in 1877.

BLACKPOOL.—Population, 10,000.—Have neither middens nor cesspools, except in connection with farms and a few scattered houses situate outside the range of the main drainage, which are inspected by the nuisance inspector, and regularly attended to. No bye-laws prohibiting their use been passed. Cesspools will be done away with when a new drainage scheme, at present under notice of Local Government Board, is carried out. Consider a fatal objection to passing a general law prohibiting construction of new middens and cesspools would be that it would necessitate carrying if sewers to every isolated piece of property, or the creation of a greater nuisance in the flowing of sewage and fæcal matter over the surface, which middens and cesspools undoubtedly prevent. Middens and cesspools are very well where a system of drainage is not convenient, but on completion of a sewer within the distance of a 100 feet, ought to be done away with compulsorily. Nearly every house in Blackpool has a water-closet. No new method adopted in 1877.

BLAYDON.—Population, 8,087.—Middens exist. No cesspools. No bye-laws have been passed prohibiting their use. Nothing as yet has been said about tub or pail system. The Board contract for removal of ash-pit contents and all refuse. Contractor bound under heavy penalties to keep middens clean; must not allow any accumulation. Ashes mixed with excreta; some of the privies so constructed as to do this. No new method adopted in 1877.

BOLTON.—Population, 90,000.—Cesspools not allowed; middens only for houses erected prior to 1875. For re-erections and for new houses, dry ash-pail system enforced. Under regulation of Acts passed in 1872 and 1877, Corporation have power to deal with these cases. The advantages resulting from passing a general law prohibiting construction of new middens and cesspools would more than counterbalance any objections that could be raised. They might be prohibited at once. Tub and pail system already adopted. Excreta are mixed with ashes. No new system adopted in 1877.

BOOTLE-CUM-LINACRE.—Population, 20,000.—Middens and cesspsols still exist here; emptied on receipt of notice from occupiers. No bye-laws have been passed to prohibit their use. Provided there be a good supply of water, there could be no objection to passing a general law prohibiting the construction of new middens and cesspools after a given time. The tub and pail system not adopted. Excreta are not mixed with ashes. No new method adopted in 1877.

BOURNEMOUTH.—Population, 10,000.—Cesspools in use outside the area drained by present system of sewers; an extension of sewers now being constructed; when completed houses within 100 feet of a sewer will be compelled to drain into it. District supplied by a water company which provide water of good quality, excepting in two rather thickly populated parts of the district, where wells are still used; they are watched by the medical officer of health, and if found to be impure, steps are taken to prevent the use of water from them. It is hoped before long use of wells for domestic purposes will be discontinued, and water supply provided by the company.

BRENTFORD.—Population, 12,000.—Cesspools exist; emptied when requisite. No bye-laws passed prohibiting their use. The objections to passing a general law prohibiting construction of new middens and cesspools would occasion a greater part of this district to be without drainage of any kind. The Board have under consideration a scheme for drainage of town. If such a scheme be carried out, the drainage of cesspools could be prohibited, but not before. No intention of adopting tub and pail system. Excreta not mixed with ashes. No new method adopted in 1877.

BRIGHTON.—Population, 100,000.—Cesspools exist, to a certain extent; yearly are decreasing in number. A connection with the sewers, as a rule, is compelled by the sanitary laws when the cesspool is full. Consider the present sanitary laws are sufficient if there be sewers. The town has a very complete system of drainage. Excreta are not mixed with ashes. No new method adopted in 1877.

BRISTOL.—Population, 182,524.—Midden system unknown; sewage conveyed by means of drains and sewers into a tidal river.

BROMLEY.—Population 12,800.—Cesspools only, emptied as frequently as a nuisance from overflow arises; no bye-laws prohibiting their use been passed. In the absence of an efficient system of sewerage, cesspools are deemed a necessity. As soon as the district is effectually sewered, they might be prohibited with advantage. No intention of adopting tub and pail system. Excreta not mixed with ashes. No new method adopted in 1877.

BURNLEY.—(A.) Population, 50,000.—Middens and cesspools for ashes and excreta mixed are abolished.

(B.) 5,300 tanks for excreta only exist, walled, sided, and covered; no such tank now allowed to be constructed.

(C.) 1,500 earthenware tanks (covered) for excreta only exist, each provided with an overflow drain to carry away liquid to main sewer.

(D.) 400 pail-closets, and 1,000 water-closets, are provided. Builders can either provision C or D system at will. Pails emptied weekly, tanks twice yearly. See no objections to passing a general law prohibiting construction of new middens and cesspools, or any of the kinds described above under the heads of A, B, and, probably C. Public advantage will begin when such prohibition is adopted. No definite system of collection or scheme of speedy removal of excreta has yet been

agreed upon. Excreta and ashes are not mixed here for any purpose. No new method adopted in 1877.

BURSLEM.—Population, 25,562.—Middens and cesspools exist; emptied when necessary. A bye-law prohibiting their use repealed some ten years ago. The majority of the Board consider properly constructed middens and cesspools may be allowed, and, to some extent, such allowance mitigates the difficulty of dealing with town sewage. The tub and pail system not adopted. Excreta carried away unmixed as manure for land. No new method adopted in 1877, but the construction of middens and cesspools is strictly insisted upon according to an approved plan.

CAMBORNE.—Population, 14,928. Middens and cesspools; emptied irregularly, when required. Bye-laws have been passed prohibiting construction of cesspools in new buildings, except where unavoidable. District very poor; as yet no drains. Earth-closets partially adopted; but were not properly attended to. Not contemplated to adopt any particular kind of tub; when new closets are erected, movable receptacles of some sort are insisted on. Where praticable ashes are mixed with excreta; as it accumulates, they are removed together. No new method adopted in 1877.

CARDIFF.—Population, 40,000.—No middens; cesspools to a limited extent; well appointed sewers, with ventilating shafts and charcoal chambers, extend over nearly all the borough. New bye-laws now in course of preparation, not yet printed. See no objection to passing a general law prohibiting construction of new middens and cesspools. In two or three years more none will exist in Cardiff, sewers being rapidly constructed. Sewage is "water carried." Excreta not mixed with ashes. No new method adopted in 1877.

CARMARTHEN.—Population 10,500.—Middens and cesspools abolished; bye-laws have been passed to prohibit their use. Not aware of any objection to passing a general law prohibiting the construction of new middens and cesspools, the limit of allowing any depending on local conditions. No steps taken towards adopting tub and pail system. Excreta not mixed with ashes. This town is well sewered, the outfall being a tidal river. All offensive matter is carried away by the heavy floods pouring down from the hills. No new method in 1877.

CHADDERTON.—Population, 14,205.—Middens and cesspools exist; emptied from one to three, or even more, months. Bye-law been passed prohibiting construction of cesspools, unless anavoidable; must be approved by Board, made and kept water tight, to be arched and covered over, and a pipe or shaft for ventilation be carried up from it. See no objection to passing a general law prohibiting construction of new middens and cesspools, which might immediately be carried into effect. Pail system is adopted. Excreta mixed with ashes only in a few instances. No new method adopted in 1877.

CHELMSFORD.—Population, 9,500.—Middens and cesspools do not exist within the drainage area of the district, only in the detached and rural parts. The provisions of the Public Health Act are enforced, requiring all drains from premises within 100 feet of the sewers to be connected. The objection to passing a general law prohibiting construction of new middens and cesspools is that that system appears the only scheme which can be adopted in rural districts, and detached portions of drainage areas, without entailing an enormous burden on property and ratepayers. It is to be hoped that the town will not adopt the tub and pail system. Excreta are mixed with ashes where middens are in use. No new method adopted in 1877.

CHELTENHAM.—Population, 41,923.—Middens and cesspools only exist in exceptional cases. Bye-law been passed prohibiting their use except when unavoidable, and then they must be constructed under certain restrictions. Hardly right to pass a general law prohibiting construction of new middens and cesspools, unless an available means of sewerage were provided. No intention of adopting tub and pail system. No new method adopted in 1877. Mr. Humphries, the Borough Surveyor, writes as follows:—

Municipal Offices, Cheltenham,
Borough Surveyor's Department,
April 29th, 1878.

"You have been furnished with the accounts of our sewage tanks and sewage farms for several successive years, up to and inclusive of 1876; in the autumn of which year the incorporation of the borough took place; and in consequence thereof, the borough accounts were subsequently made up to a different period, embracing only 10 instead of 12 months, so that I am unable now to furnish you with an entire year's statement of amount. I subjoin, however, the best I can give you, and they are really correct to the extent I have stated. From September, 1877, I have no doubt of being able to furnish full and complete accounts yearly.

Cheltenham Sewage Tanks.

For ten months to September, 1877.

	£	s.	d.
Receipts for sewage manure	291	4	6
	£291	4	6
Payments for working and general expenses	223	3	7
Overplus	68	0	11
	£291	4	6

The average overplus of the seven previous years was £66 1s. 2d.; this, however, does not include the value of the ashes.

Cheltenham Sewage Farm.

For ten months to September, 1877.

RECEIPTS.

	£	s.	d.
Rents	612	18	6
Fluid sewage on adjacant lands	93	13	3
Timber sold	22	2	6
	£728	14	3

PAYMENTS.

Wages, tradesmen's bills, and expended in works	214	7	3
Rates and taxes, including school rate, and increased rating	92	5	3
Interest on loan	347	7	5
Overplus	74	14	9
	£728	14	6

CHESTERFIELD.—Population, 11,427.—Middens and cesspools still exist; emptied, when required,

by the local authorities. No bye-laws been passed prohibiting their use in future. Too wide a question to answer as to whether a general law prohibiting their use is desirable, and difficult to say how soon they might be prohibited with public advantage. No intention of adopting tub or pail system; excreta are speedily removed, and are mixed with ashes for the convenience only of removal. No new methods adopted in 1877.

CHESTER.—Population, 25,257.—The inspectors of nuisances report regularly upon all middens or cesspools, and they are quickly removed. The old bye-laws had stringent regulations: new ones now in course of formation will be still more strict. Consider that no general law could be formed so as to apply to every town and district alike. This city does not intend to adopt the tub or pail system. Excreta are not mixed with ashes; new outfall works discharging into tidal river satisfactorily.

CHORLEY (Lancashire).—Population, 16,864.—Some middens and cesspools still exist; are gradually giving way to the pail system, emptied as often as full, say every six months. No compulsory measures taken to prohibit their use, but new houses are supplied either by water-closets or pails. See no objection to passing a general law prohibiting construction of new middens and cesspools, but it must depend on circumstances; in purely rural districts it might be a hardship. Tub and pail system extensively adopted, recommended as the best known system of removing the excreta. Excreta are mixed with ashes, but a considerable amount is conveyed directly on to, and spread on the land as farmers require it. No new method adopted in 1877.

COLCHESTER.—Population, 28,000.—Middens and cesspools still exist; emptied when required. Stringent bye-laws have been passed in regard to construction of water-closets, privies, cesspools, and ash-pits. Cannot see sufficiently into the future to tell whether it be desirable to pass a general law prohibiting the construction of new middens and cesspools. In "rural" parts of urban districts they might always be required. Nothing settled yet as to the tub and pail system being adopted. Excreta not mixed with ashes. No new methods adopted in 1877.

COVENTRY.—Population, 37,670.—Middens and cesspools exist, emptied by Corporation servants when necessary. Efforts are being made to convert them into water-closets; it is not intended to adopt tub and pail system. Excreta are mixed with ashes only for convenience of removal. No new method adopted in 1877.

DALTON.—Population, 11,500.—No cesspools; middens to a large extent (80 per cent.), which are emptied from 1st June to 1st September fortnightly; in winter, monthly; no bye-laws prohibiting their use have been passed. Where a complete system of drainage exists, there would be no objection to passing a general law prohibiting the construction of new cesspools and middens, but, in the case of isolated dwellings, impossible to do without them. In a district provided as above, they might with advantage be prohibited in twelve months. Adoption of tub system proposed for removal of dust and house refuse, and water-carriage system for speedy removal of excreta. Excreta are mixed with ashes. No new method adopted in 1877.

DERBY.—Population, 49,810.—Middens and cesspools exist; emptied at periods varying from three to twelve months. No bye-laws have been passed prohibiting their use; in the absence of a more perfect and complete system of drainage, entire prohibition seems far distant. The pail system already adopted to some extent. Where excreta are mixed with ashes, it is not the result of any general rule laid down for convenience of removal. No new method adopted in 1877.

DEVONPORT.—Population, 49,449.—Except in about a dozen isolated cases, all water-closets and privies are connected with sewers emptying into tidal waters. Measurers being taken to remedy the exceptions. No intention of adopting tub and pail system. Excreta not mixed with ashes. No new method adopted in 1877.

DEWSBURY.—Population, 24,773.—Middens and cesspools still exist; emptied frequently by the officers of the sanitary authority. No bye-laws been passed to prohibit their use. Consider there would be no objection to passing a general law prohibiting use of middens and cesspools, if every town was well sewered and better means devised for removal of excreta; probably some years before such a prohibition could be carried out. Probably the town will adopt water trough system in preference to tub or pail. Excreta are mixed with ashes. No new method adopted in 1877.

EASTBOURNE.—Population, 12,000.—Middens and cesspools scarcely exist. Very imperfect bye-laws. See no objection to passing a general law prohibiting construction of new middens and cesspools if facility is offered for the efflux or other removal of sewage by main conduits. No intention of adopting tub and pail system. Excreta are not mixed with ashes. No new method adopted in 1877.

EBBW VALE AND ABERTILLERY.—Population, 10,000.—In the towns of Abertillery and Ebbw Vale, as in nearly the whole of the iron works and colliery villages in Monmouthshire, middens and cesspools exist, and are not cleared until they become dangerous nuisances. It is not practicable or legal to pass bye-laws to prevent the use of cesspools with proper doors and coverings, and this fact prevents the various local authorities from being able to compel one system of disposing of sewage, &c. Abertillery district is adopting the model Local Government Board form. It would be necessary, in the first place, to pass a law compelling local authorities to adopt such a system of sewage as would make it practicable to dispense with cesspools. This being accomplished, and proper water supply for flushing drains, or uniform system of dry earth, or other similar means of dealing with the excreta, adopted for the district, middens and cesspools, might advantageously be prohibited and abolished. At Ebbw Vale, water-closet system will probably be adopted, as a most valuable and ample water supply is being obtained. At Abertillery the tub system will probably be adopted. In parts of Abertillery excreta are mixed with ashes. The difficulty arises of the want of ashes in summer

when most required. In small cottages hardly any ashes are available in the hot summer months. No new method adopted in 1877.

ELY.—Population, 8,162.—Middens and cesspools not used for the last 22 years; water-closets have taken their place.

EXETER.—Population, 34,648.—No middens or cesspools in this place.

FAVERSHAM.—Population, 7,319.—Very few middens and cesspools; Corporation have them filled in when they find them. Bye-laws have been passed prohibiting their use. Consider a general law for prohibiting them not advisable, as they cannot be abolished in the country, where no drainage exists; in other places it would take two years to do without them. Have good sewers running into a creek. Excreta not mixed with ashes. In 1877 everyone has been compelled to close their vaults and empty into the sewer.

FROME.—Population, 9,752.—Very few cesspools exist; emptied yearly. No bye-laws been passed prohibiting their future use. Consider there would be no objection to passing a general law prohibiting the construction of new middens and cesspools, which Act might with public advantage be carried out at once. No intention of adopting tub or pail system. Present closets connected with sewers; running into sewers as before. No new method adopted in 1877.

GAINSBOROUGH.—Population, 8,000.—Middens and cesspools abound, and emptied when full. No bye-laws prohibiting their use passed. Consider it would be a mistake to pass such a law. Tub or pail system not adopted. Excreta with ashes for convenience only of removal. No new method adopted in 1877.

GRAVESEND.—Population, 19,995.—Middens and cesspools still exist; emptied when required; the deep ones go for many years. No bye-laws passed prohibiting their use in future. The objection to passing a general law in this town prohibiting their use is that there is no other way practicable, the town not being drained, and the expense it would cause. The question of sewering the town is under the consideration of the Corporation, but the difficulty of knowing what to do with the sewage, and the objection of the Conservators of the Thames, are the obstacles. No objection has ever been found to the deep (say, 40 ft.) cesspits, but those nearer the river, and shallow, are objectionable.

HUDDERSFIELD.—Population, 73,000.—Such middens and cesspools as remain are reported when requiring to be emptied. By Local Act, none allowed without consent of Corporation, and are gradually being displaced, as sewerage system extends. Sanitary regulations embodied in the Huddersfield Improvement Act, 1871. The operation of the Public Health Act, 1875, combined with Local Acts, will prohibit construction of new middens and cesspools. Tub system largely adopted; ash-pits are quite separate, and are separately dealt with in removal.

HYDE.—Population 14,273.—Very few cesspools; middens, with ashes, mixed in considerable number, emptied every three months. No bye-laws passed to prohibit their use in future. See no objection to passing a general law prohibiting the construction of cesspools and middens, if some better plan be found, applicable to all situations. No intention of adopting tub or pail system. The authorities here in favour of water-closets, as they have an excellent system of sewers constructed since 1864. Sewage water carriage. Excreta are mixed with ashes for convenience only of removal. No new method adopted in 1877.

KENDAL.—Population, 13,442.—Cesspools, with few exceptions, ceased to exist; considerable number of middens still in use, emptied only once or twice a year. New bye-laws in course of preparation, which will contain stringent regulations for emptying. No objection to general law prohibiting construction of new middens and cesspools, if dry ash-pits, properly roofed and ventilated, are substituted; it would not seem just to prohibit them altogether, unless the authorities were obliged to undertake the removal of all excreta at public expense. Tub and pail system not adopted, but the advantages of the system recognised. Excreta not regularly mixed with ashes, though frequently done. No new method been successfully adopted in 1877.

KETTERING.—Population, 7,184.—Middens and cesspools exist to a great extent; a large number during the last few years have been converted into water-closets, with water laid on. No bye-laws have been passed. The Board encourage the construction of water-closets wherever they can. Consider no objection to passing a general law prohibiting construction of new middens and cesspools where waterworks exist, or where other systems are in use for removal of excreta, but when this prohibition can be carried out depends on circumstances. Where middens exist, ashes are kept to assist in removal. The method adopted in 1877, which answers admirably, is the systematic removal of house refuse and ashes.

KIDDERMINSTER.—Population, 19,463.—Middens and cesspools exist to some extent, emptied when required. No bye-laws been passed prohibiting their use. Water-closets enforced where possible. A general law prohibiting construction of middens and cesspools only practicable where waterworks exist. No intention of adopting tub or pail system. Excreta in most cases mixed with ashes. No new method adopted in 1877. This town well sewered, and has an ample high pressure water supply. Sewage pumped on to the Corporation Farm, four miles distant.

KINGSTON-UPON-HULL.—Population, 133,932.—Privies exist almost universally; emptied weekly. See no objection to passing a general law prohibiting construction of new middens and cesspools that might not with determination be overcome; the cost, and indisposition of authorities, to make great, even if much needed, alterations stands in the way. Pail system been strongly reccommended by health officer, but not adopted at present. Excreta mixed with ashes for removal, and for deodorising the material. No new method adopted in 1877.

LEEDS.—Population, 259,200.—The process employed is so far successful that the sewage is purified quite sufficiently for the large river into which

it runs. The sludge is practically unsaleable at a profit; there is not at present any on hand, it having been disposed of to clear the ground. Of four different processes the analyses of the sludge show:—

Nitrogen ..	0·504	0·56	0·45	1·12
equal to				
Ammonia ..	0·6	0·34	0·544	1·36

LEEK.—Population, 12,123.—During the last five years 403 middens and cesspools abolished. About 500 remain; emptied twice a year on the average. No bye-laws passed prohibiting their use. See no objection to passing a general law prohibiting construction of middens and cesspools, which might be enforced in twelve months. Only remedy for existing cesspools is to fill them up. 720 water-closets. Ashes and garbage from 400 houses removed weekly; tubs supplied at 3s. 6d. each. Cheapest plan for removal. Excreta not mixed where midden and cesspool system exists. Water-closet system works satisfactorily where there is one to each house, tolerably so where there are two houses to one water-closet. During the year ending March, 1878, removed 3,159 tons of house ashes and garbage, being 2,159 tons from ash-pits, and 1,000 tons by the tub system, viz., weekly removals. During the same time 285 tons of night-soil from cesspools was removed. The total cost of all ashes and night-soil removals was £320. The nuisance avoided by the adoption of the tub system for weekly removal of ashes is a matter of some importance, having regard to the process of employing an ash pit, viz.: (1) The man throws the ashes out of (perhaps, midden or pit, with which no human being ought to be allowed to enter) into a yard; (2) gathers them up again into a barrow, and wheels them into the public street, empty them, (3) and again gathers them up to be thrown into the cart. Sewage carried by gravitation to and given to the owners of certain lands near the town used for the purpose of irrigation. Leek is a manufacturing town. Rate of mortality to 1,000 living, during the year 1877, was 17·5.

LEICESTER.—Population, 95,084.—Still continue the process which has been in operation at the sewage works here for twenty-four years, viz., the use of lime for the more rapid precipitation of the solid matters contained in the sewage; and by the use of one ton of lime to the million gallons of sewage some 20,000 tons of solid matter are deposited annually. The effluent water is not satisfactorily purified by the process, and great complaint is made of the re-putrefaction of the water in hot weather, which is felt at a considerable distance below the works. In the hope of obtaining a purer effluent, ten acres of additional land immediately below the works have been purchased. Additional reservoirs are now constructing, with about 400 yards of additional weirage. The effluent water will be delivered on to some four acres of land set with osiers, the lower portion of the land will be laid out as downward filters. This alteration is only a temporary arrangement. There s in contemplation a scheme for irrigation and idownward filtration on an extensive scale some five miles below the town. The precipitated sludge amounts to some 20,000 tons per annum; about 50 per cent. of water. The great difficulty is the same as that of all others having sludge to deal with, viz., getting it dry and getting rid of it. What is much wanted is a cheap mode of drying the sludge; the best is that patented by Kidd, of Wrexham. The solid matter has not been analysed for some years; it was then valued at 12s. per ton; it is worth more now as water-closets have increased; some 20,000 tons in hand.

LICHFIELD.—Population 7,347.—Middens and cesspools partially exist; no appointed period for emptying; dry contents of middens at many houses removed every Saturday. No bye-laws prohibiting their use been passed. Consider there would be an objection to a general law prohibiting construction of middens and cesspools, but the place and mode of their construction require the general law of regulation. Tub and pail system not been considered. Excreta partially mixed with ashes. No new method adopted in 1877. Town Council are engaged in a very costly scheme of outfall.

LINCOLN.—Population 31,000.—Middens and cesspools still exist; emptied when required, but at no specific periods. No bye-laws been passed prohibiting their use. Until the drainage scheme, now being carried out, is completed, no occasion for the law to be altered, as far as Lincoln is concerned. No intention at present of altering present system, which is that of ash-pits, vaults, and boxes. Excreta are not mixed with ashes. No new method adopted in 1877.

LOUTH.—Population, 10,500.—Middens and cesspools still exist; emptied at night at proper intervals by scavengers. No occasion for bye-laws. Public Health Act provides all that is necessary. Unless sanitary authority provides drains within reasonable distance of every dwelling, a general law prohibiting use of middens and cesspools objectionable. Box system used to a certain extent, but not compulsory. Excreta mixed with ashes. No new method adopted in 1877.

LOWESTOFT.—Population, 15,246.—Middens exist; emptied about once a month; very few cesspools. No bye-laws prohibiting their future use been passed. Some parts of the town are not sufficiently well drained to admit of passing a general law prohibiting construction of new middens and cesspools. No intention of adopting tub and pail system. Excreta still mixed with ashes for convenience only of removal. No new methods adopted in 1877.

MACCLESFIELD.—Population, 35,451.—Middens exist which are covered in and emptied regularly by Local Board. Cesspools not permitted. No separate bye-laws dealing with middens and cesspools. No objection to prohibiting cesspools, but there would be a difficulty without middens as to storing ashes. Tub and pail system not adopted. Excreta still mixed with ashes. No new method adopted in 1877.

MAIDSTONE.—Population about 27,000.—A complete system of drainage being carried out by Mr. Lewis Angell, C.E., of Stratford. Sewage will be treated with lime process, and the effluent water discharged into a tidal river. Middens and cesspools will be done away with.

MANCHESTER.—Population, 351,189.—A few middens still exist, rapidly being superseded. City Council has passed a resolution requiring them to be abolished. Act of Parliament requires owners of property to provide closets to the satisfaction of the Council. No middens and cesspools have been constructed here for some years. Pail system adopted here; 38,049 closets have been converted. Excreta are mixed with ashes. No new method during the year 1877.

MERTHYR TYDFIL.—Population, 54,100.—Cesspools have been abolished. Middens only exist in connection with stables and cowhouses, which are emptied weekly. No bye-laws prohibiting use of cesspools and middens have been passed. Some new bye-laws under consideration. See no objection to passing an Act prohibiting construction of cesspools, which with public advantage might, say in two years after passing a general Act, be prohibited. Is a water-closet town. Excreta are not mixed with ashes. No new methods been adopted in 1877. The Merthyr Tydfil and Aberdare Local Boards have agreed that the sewage of the latter town, with a population of 38,000, shall be disposed of upon the Merthyr Boards lands at Parknewrydd, Coom, Glyncoch, Navigation, and Yniscoedwdwg, together with the surface of another farm, Berwerdy, containing 63 acres to be acquired. The whole of these lands adjoin the bank of the River Taff, and are situate at a distance of about eight miles from Aberdare; they embrace a total area of 295 acres, consisting of a deep bed of gravel covered with a layer of loamy mould, varying in thickness from a few inches to four or five feet. The whole of these lands were included in the original scheme for the disposal of the Merthyr sewage, but it has been found, from experience, that the land is capable of absorbing and purifying, without depreciation, a much larger quantity of sewage than was at first supposed. In addition to the 295 acres already mentioned, there are 100 acres applicable for the Merthyr sewage, but which cannot be reached by the Aberdare sewage. The farms are to be managed by a joint committee appointed by the two Boards. Negociations are now pending with the Mountain Ash Local Board for taking also the sewage of that district, which has a population of 7,000.

NEWPORT, MONMOUTHSHIRE.—Population, 32,000. Middens and cesspools do not exist. No bye-laws been passed to prohibit their use. In some towns, Newport, for instance, where a system of sewage into a tidal river has been adopted, there would be difficulty in adopting earth-closet system to a small extent in the outskirts where drainage has not yet been provided, and in these exceptional cases, cesspools seem the only alternative, at present a general law, without exceptions, may work hardships in some cases. No new method adopted in 1877.

NEWTON HEATH.—Population, 21,600.—Middens and cesspools exist; are emptied about every four months. No new bye-laws have been passed. So far as this district is concerned the use of middens and cesspools might be prohibited at once. Tub and pail system adopted about five years since. Excreta mixed with ashes for convenience of removal only. No new method adopted in 1877.

NORWICH.—Population, 84,000.—Cesspools only exist in the parts of the corporate district where the houses are at some distance apart, and there are no sewers. Middens or privies emptied by the Corporation contractors, who contract to empty when necessary. No bye-laws have been issued. No objection to passing a general law prohibiting construction of middens and cesspools, assuming there was no sewer within 100 feet of the dwelling house or buildings to be drained. Excreta and house refuse generally mixed. No new method adopted in 1877.

NOTTINGHAM.—Population, 92,251.—Middens and privies still exist, not cesspools; privies and middens are now prohibited from being built. All new houses must be provided with water-closets and dry ash-tubs, or pail-closets. No bye-laws exist. Consider there are no objections to passing a general law prohibiting the construction of new middens and cesspools after a given time. It must be a gradual process. The pail system adopted for houses let at weekly rents. All old privies and middens abolished, and pail-closets substituted. Excreta still mixed with ashes for convenience of removal only. No new methods adopted in 1877.

NUNEATON.—Population, 7,399.—Middens and cesspools exist, emptied by Local Board when necessary. No bye-laws, prohibiting their use at present, passed. No objections to passing a general law prohibiting the construction of new middens and cesspools if dry closets were substituted for the privy, but the carrying out such a prohibition must be a work of time. Excreta are still mixed with ashes for the convenience only of removal. Some closets have recently been built on the dry system.

OPENSHAW.—Population about 14,000.—All premises erected before 1875 have middens, emptied by Local Board when required, averaging six times a year. Since 1875, all new premises are required by Local Board to adopt cinder shifting system. The Board supply builders with pans and boxes at 6s. each. Consider that old premises could not be compelled to adopt the system without a heavy cost being thrown on owners. Excreta removed in pans when used, otherwise mixed with ashes; four men and three horses employed in night soiling and watering, when required, three miles off road.

PENRITH.—Population, 8,317.—Middens exist in many parts of the town, emptied when required by Board's scavengers for owners. Cesspool none, never emptied by the Board, only used where there is no public sewer within 100 feet of the premises. No bye-laws on this subject in use. There appears to be no particular objection to prohibiting construction of new middens, except in places where the Board's scavenger would have to extend considerably his area for the collection of ashes from boxes. In many places middens are necessary where there are privies and not water-closets. Wherever middens can be used in open neighbourhoods with privies, they are found less objectionable than water-closets, which are frequently getting out of order, and are a fruitful cause of waste of water. Tub and pail system not

been thought of. Excreta are mixed with ashes, which make the premises more wholesome. No new method adopted in 1877.

PENZANCE.—Population, 10,414.—No middens and cesspools; town thoroughly sewered, and water-closet accommodation was provided for each house soon after passing Public Health Act of 1848. Bye-laws have not absolutely prohibited use of middens and cesspools, but they must be constructed as the Local Board directs. As far as this town is concerned, there would be no objection to passing a general law prohibiting their use. No intention of adopting tub and pail system. No new methods adopted in 1877.

PETERBOROUGH. — Population, 18,000. — Middens and cesspools exist; no stated time for emtying. No bye-laws bearing upon the subject. Consider there are no objections to a general law prohibiting construction of new middens and cesspools. A new sewer system being carried out, when completed, water-closets will be generally adopted. Tub and pail system has not been adopted. As a rule, privy vaults are not connected with ash-pits. No new methods adopted in 1877.

PLYMOUTH.—Population, 71,000.—Middens not allowed nor cesspools in the populous part of the town, but are permitted for buildings in the suburbs and outskirts 100 feet beyond any existing sewer. No bye-laws passed prohibiting their use. Objection to passing a general law prohibiting construction of new middens and cesspools consists in numerous houses here being erected more than 100 feet from any sewer under control of sanitary authority. Such prohibition must entirely depend on local circumstances. No intention of adopting tub and pail system. Excreta are not mixed with ashes. No new methods adopted in 1877.

PORTSMOUTH.—Population, 113,569.—Middens and cesspools still exist; in 1873 there were 12,247 houses out of 19,505 supplied with privies, in 1876 the number was reduced to 9,719 out of 20,351; this year the number again reduced by 2,000 to 3,000. No new houses allowed to be built without connection with the main sewer, if within 100 feet of it. Practically, all new houses connected. See no objection to passing a general law prohibiting construction of new middens and cesspools, if any sewer existed in the neighbourhood, and such prohibition to come into operation as soon as each town is provided with an adequate system of sewers. No intention of adopting tub and pail system. There is great antipathy to tub and pail system, as a company worked a patent process on this plan, for manufacturing a concentrated manure, and made such an intolerable nuisance that it had to be put a stop to by an expensive lawsuit. Excreta not mixed with ashes. No new methods adopted in 1877.

RADCLIFFE. — Population, 11,446. — Ash-pits emptied from four to five times each year. No bye-laws passed prohibiting their use. Consider there would be every reason to object to passing a general law prohibiting construction of new middens, taking that term to mean ash-pits, but cesspools ought to be abolished, and might, with public advantage, be done away with in 12 months. Tub and pail system not adopted; an improvement in construction of ash-pits is being adopted. Excreta and ashes mixed, and used as manure. A new system being now adopted.

REIGATE.—Population, 15,916.—Middens and cesspools exist, emptied at different intervals, generally speaking, when they run over. No bye-laws passed absolutely prohibiting their use. Consider in a scattered community, as in this locality, they canpot be altogether prohibited. Tub and pail system not adopted. Ashes only rarely mixed with excreta. No new method adopted in 1877.

RHYMNEY.—Population, 9,500.—No middens; cesspools allowed. No bye-laws prohibiting their use have been passed. This district is not a town, but a long village, houses being situated mainly along the road side for two miles, with open country behind, on an elevated position, with short supply of water in dry seasons. Cesspools not considered here objectionable, except by such as prefer the "open." Privies, with cesspools, have been built in 1877; none in existence before.

ROCHDALE.—Population, 67,590.—Middens and cesspools exist; emptied irregularly; chiefly when requested by householders. No bye-laws. Health committee have passed a resolution to the effect "that privies which have not been built or altered to meet the arrangement of the pail system should forthwith be required to do so." Consider no objection to a general law prohibiting construction of new middens and cesspools; such law might come into force within a year. Pail system already adopted. Excreta are not mixed with ashes. A new method of drying excreta has been successfully adopted in 1877.

ROYSTON.— Population, 7,794.—Middens and cesspools still exist; emptied at no defined period. Bye-law been passed prohibiting cesspools unless unavoidable, when their construction shall be according to rules laid down by Local Board. Consider no objection to making a general law prohibiting construction of new middens and cesspools, which might be enforced in twelve months. Sanitary pans as a rule used in new closets. Excreta are mixed with ashes at old property, but are gradually being abolished.

RUGBY.—Population, 8,400.—Very few middens and cesspools. Consider that the objections to passing a general law prohibiting construction of new middens and cesspools is the inability to provide earth for earth closets, and scavenging them, especially in rural districts. Tub and pail system not adopted here. Water-closets in general use; some privies altered for use of tubs or pails; but as no general system of supplying earth is adopted, although proving a palliative on the cesspit, it would be avoided by construction of water-closets.

RYDE, ISLE OF WIGHT.—Population, 11,234.—No middens and cesspools. No bye-laws, because no building is approved which does not provide properly constructed and ventilated closets. Consider it is in the power of every authority as the bye-law stands to prevent middens and cesspoools being constructed. They could be prohibited immediately if any Medical Officer of Health declared any habitation unhealthy in consequence of their presence. No intention of adopting tub and pail

system. Excreta still mixed with ashes for convenience only of removal. No new methods adopted in 1877.

SCARBOROUGH.—Population, 24,259.—No middens or cesspools known to sanitary authority, except two cesspools recently discovered; steps are being taken to remove them. Can be no objection to passing a general law prohibiting construction of new middens and cesspools. Excreta removed weekly. No other method in contemplation; the sanitary authority would gladly avail themselves of any improvement. Excreta are still mixed with ashes for the convenience of removal. No new methods adopted in 1877.

SHEFFIELD. — Population, 260,000. — Middens and cesspools still exist; very few of the latter. The period for emptying middens varies considerably, according to size and other circumstances. No bye-laws been passed prohibiting their use in future. Consider that many objections could be urged against the prohibition of middens and cesspools by a general law. In the opinion of many, a properly constructed midden or ash-pit, emptied frequently, is preferable to the "pail or tub" system. The Corporation have no intention to adopt this system. Excreta are mixed with ashes for convenience of removal. No new method adopted in 1877, beyond an improvement in the construction of ash-pits, by which everything unfit for agricultural purposes is kept out.

SOUTHAMPTON.—Population, 56,404.—Neither cesspools nor middens exist in the town. No bye-laws have been passed to prohibit their use. Consider there would be no objection to passing a general law prohibiting the construction of new middens and cesspools after a given time. The town is supplied with water-closets. No new method adopted in 1877.

SOUTHPORT.—Population, 18,085.—Middens and cesspools exist; periods of emptying differ, according to size of ash-pits. No bye-lays been passed prohibiting their future use. Consider there would be no objection to passing a general law prohibiting construction of new middens and cesspools, new ones could be at once prohibited, old ones must be got rid of gradually. No intention of adopting tub and pail system, but a system of speedy removal of refuse in boxes. Excreta at present mixed with ashes, in future to be kept separate. The Health Committee recommended the Council to adopt a water-carriage system for removal of excreta.

SOUTH SHIELDS.—Population, 45,336.—Middens and cesspools still exist; emptied from six weeks to six months. Action has recently been taken under the nuisance clauses of the Public Health Act to cause middens in the more crowded localities to be removed, and privy accommodation provided according to the following plan. For properties of more than four tenants, and for those not accessible by the scavenger's cart, the Liverpool trough closet; for properties of four, and less than four tenants, the fixed dry privy receptacle; not more than 10 cubic feet internal capacity, and emptied at least weekly (a modification of the Hull or Glasgow privy); it has been decided also, by resolution of the authority, to require the dry privy receptacle to be provided for new property in lieu of the midden. Consider a general law should be passed without delay prohibiting construction of new middens and cesspools, which prohibition, with public advantage, might be carried out in twelve months. The tub and pail system is to be adopted. Excreta are mixed with ashes for convenience of removal. In 1877, the Liverpool trough has been successfully adopted for large properties; the Hull or Glasgow privy for smaller properties and self-contained houses.

ST. HELENS (Lancashire).—Population, 45,000. —Middens and cesspools exist, emptied about four times a year. No bye-law been passed prohibiting their use. Consider there would be no objection to passing a general law prohibiting the construction of new middens and cesspools, supposing the dry earth system or water-closets were adopted. No intention of adopting tub and pail system. Excreta still mixed with ashes for convenience of removal only. No methods adopted in 1877, but all new ash-pits are covered.

STAFFORD.—Population, 12,212.—Middens exist, and emptied on notice being given at the sanitary office; no bye-laws prohibiting their use been passed. A general law, prohibiting construction of new middens and cesspools, a great necessity, there could be no objection to it in towns of any size, and it might be carried out in three years. Tub system partially in use. Excreta mixed with ashes, for convenience of removal. No new methods adopted in 1877.

STOCKTON-ON-TEES.—Population, 33,000.—Middens and cesspools exist; emptied from 7 to 28 days, as the inspector may direct; no bye-laws been passed prohibiting their use. If a general law was passed prohibiting construction of cesspools and middens, it would entail necessity of altering system of sewers now in use in the borough, and cause manure, for which there is a great demand, to be expensive. No resolution has been come to on the subject of tub and pail system. Ashes principally mixed with excreta, as a deodoriser. The new method successfully adopted in 1877 for new privies, has arranged that the ashes cover the soil when thrown into ash-pits.

STRATFORD-UPON-AVON.—Population, 7,342.— Some middens and cesspools still in use; emptied once or twice yearly. Under a minute of the Board, closets to all new houses by sewers are fitted up with sanitary pans. If a general law was passed prohibiting construction of new middens and cesspools, closets must either have sanitary pans, or be earth or ash-closets, the former least objectionable. Local authority recommend use of sanitary pans where there are sewers. Excreta in some cases mixed with ashes. No new method adopted in 1877.

SUNDERLAND.—Population, 103,000.—Middens exist; emptied about every two months. A resolution of the Council been passed, that in new streets pail system shall be introduced. Only objection to general law being passed prohibiting the use of middens and cesspools, would probably be the expense; but the sooner they are prohibited the better. Tub and pail system adopted. Excreta are mixed with ashes. The pail system, with a fixed screen, has been the new plan adopted in 1877.

SWINDON, NEW.—Population, nearly 12,000.—Sewage carried into a main sewer which discharges into a reservoir (by gravitation) on a sewage farm of about 100 acres, where the sewage is afterwards disposed of in the usual way.

SWINTON AND PENDLEBURY.—Population, 20,000.—Middens and cesspools exist, the former emptied every three months. No bye-laws prohibiting their use. No objections to passing a general law for this purpose; some difficulty would be found in dealing with a system to suit all districts. No intention of adopting tub and pail system. Excreta are mixed with ashes for convenience of removal. No new method adopted in 1877.

THORNHILL.—Population, 6,400.—Middens and cesspools still exist; emptied irregularly. Consider there would be no objections to passing a general law prohibiting construction of new middens and cesspools, and the prohibition might soon be carried out. Tub, pail, or some such system intended to be adopted. No new methods adopted in 1877.

TIVERTON.—Population, 10,024.—Very few middens and cesspools exist. No bye-laws have been passed prohibiting their use; the Public Health Act, 1875, found sufficient for all purposes. Do not think cesspools could be prohibited altogether. There must be cesspools, if there are no sewers. No intention of adopting tub and pail system. Excreta are not mixed with ashes.

TOTTENHAM.—Population, 23,000.—Process used here for treating sewage is that of Mr. Fritz Hillé, which is decidedly satisfactory in its working. Of late little or no difficulty in getting rid of sludge. Cannot furnish any analysis of sludge showing its fertilising constituents.

TROWBRIDGE.—Population, 11,671.—Few if any middens and cesspools exist. The town has been thoroughly drained, and all privies are being connected with the main sewer as quickly as possible. Have a good supply of water. Dry earth-closets not sanctioned by the Local Board, being found inefficient, from the impossibility of getting them properly worked. The next step, which seems surrounded with difficulties, is the disposal of sewage. No new method adopted in 1877.

TUNBRIDGE WELLS.—Population, 19,410.—Middens and cesspools exist in a few isolated cases, in outlying districts, where there is no public sewer. No bye-law has been passed prohibiting their use, but they are not allowed. No objection to a general law prohibiting their use. Tub and pail system not been adopted. Excreta are not mixed with ashes. No new methods adopted in 1877.

TUNSTALL.—Population, 13,540.—Middens and cesspools used, emptied every few months according to size. No bye-laws been passed prohibiting their use; and a general law to that effect not desirable, as there would be a difficulty in substituting some other plan equally simple, cheap, and suitable for working classes. No idea of adopting tub and pail system. Excreta kept separate from the ashes, water-tight cesspools being formed under the floor of the privy, and for purposes of emptying the seat is hung to fall back against the walls.

WALLASEY.—Population, 14,819.—Middens still exist, and emptied when full. No bye-laws exist. Consider there can be no objection prohibiting cesspools when public sewers are available. Middens appear to be a necessity in semi-rural districts, unless daily removal of refuse be adopted. Tub and pail system been tried in the more densely built part of the district with great success; question of general use of this mode has not been before the Board.

WEDNESBURY.—Population, 27,000.—Middens and cesspools exist; emptied at irregular periods when full. No bye-laws prohibiting their use exist. No objections to passing a general law prohibiting the construction of new middens and cesspools, if a better system could be initiated; they are an evil, and their immediate removal would be a sanitary boon. Tub and pail system not intended to be adopted. Excreta generally mixed with ashes. No new methods adopted in 1877.

WELSHPOOL.—Population, 7,318.—No cesspools and middens. No bye-laws yet been passed. New ones being constructed similar to model bye-laws of the Local Government Board. Consider there would be no objection to passing a general law prohibiting construction of new middens and cesspools after a given time. No intention of adopting tub and pail system. Excreta not mixed with ashes. No new methods adopted in 1877.

WIDNES.—Population, 9,000.—Middens and cesspools exist; the former emptied on an average half-yearly; cesspools (for excreta only), once in one or two years. No bye-laws been passed prohibiting their use in future. Survey here now being made for a general sewage scheme; when this has been carried out, shall be willing to take into consideration abolition of cesspools, probably not middens. Sewage system cannot be completed here for three or four years, the probability is that water-carriage alone will be adopted; no formal decision arrived at. Two kinds of privy here in use, one in which excreta and ashes are mixed, the other in which they are separate; the former preferred as the more convenient. No new methods adopted in 1877.

WINDSOR.—Population, 11,769.—No middens and cesspools exist in the town of Windsor, A bye-law been passed only allowing cesspools when unavoidable, See no valid objection to passing a general law, provided the time given be sufficient to allow of a complete system of sewage and disposal of sewage manure, &c., being substituted; this appears to depend on the special circumstances of each particular town. No intention of adopting tub and pail system. Excreta are not mixed with ashes. No new methods adopted in 1877.

WINSFORD.—Population, 8,500.—Middens and cesspools exist; regret to say not systematically emptied. Board only been recently formed. Bye-laws have been passed. Consider there would be no serious objection to passing a general law prohibiting construction of new cesspools and middens, except in the rural part of urban districts where there is no system of sewage; such prohibition might be carried out in three years. The Board contemplates obtaining advice as to tub and

pail system; they endeavour to keep excreta and ashes separate. No new methods adopted in 1877.

WOLVERHAMPTON. — Population, 70,000. — Several old middens and cesspools still existing; gradually being converted into pan-closets. The Public Works Committee only approve of plans for new buildings that provide for water-closets or pan-closets with dry ash receptacles. No objections to passing a general law prohibiting construction of new middens and cesspools after a given time. The Town Council adopt the pan system and speedy removal of excreta. In many instances excreta are mixed with ashes for convenience of removal. The pan system has been gradually introduced into the borough with success.

WORCESTER. — Population, 33,226. — Middens and cesspools exist to some extent; emptied on applying to the Inspector of Nuisances. No bye-laws have been passed prohibiting their use. Consider that a total prohibition of middens and cesspools is neither desirable nor practicable. No intention of adopting tub and pail system. Excreta are mixed with ashes for the convenience of their disposal. No new methods adopted in 1877.

WORKINGTON.—Population, 9,000.—Still some middens remaining, emptied by the Board's carts when required, by order of inspector of nuisances. No bye-laws been passed. No objections to passing a general law prohibiting construction of new middens and cesspools. Consider three months' notice sufficient. Nearly all the town compelled to construct water-closets. With exception of few remaining middens, no excreta mixed with ashes. No new method adopted in 1877.

WREXHAM.—Population, 8,537.—No cesspools. Middens still exist, being gradually reduced in number. No bye-laws. There would be no objections to passing a general law prohibiting construction of new middens and cesspools. If a general law were passed, the removal could be commenced forthwith, and would require about six months for completion. The sanitary authority of Wrexham require construction of water-closets to all new houses, No intention of adoping tub and pail system. Excreta are mixed with ashes in the process of private storing previous to removal.

Colonel Alfred S. Jones sends the following memorandum:—

1. Early in January, 1877, experiments were undertaken with Mr. J. H. Kidd's sludge drying machine at Wrexham, and it was soon found that the sulphurous acid and other gases, which, in that machine, have direct access from the burning fuel to the moist sludge, are most effective in preventing the smell which would arise from sludge heated without the intervention of those gases, and it is presumed that dry sludge, in which the ammonia has thus been fixed, will be found more valuable as manure than similar sludge dried without the direct influence of those gases.

2. Mr. W. A. Gibbs has long discovered the advantage of this direct application of gases, the products of combustion in his hay and corn drying machine, and Mr. Alfred Fryer has also claimed the principle in his "concretor" for evaporating urine, &c., and there can be no doubt of its useful influence in drying sewage sludge and fæcal matter, but I am not yet prepared to say that the economy and expediency of drying these matters in any way has been fully proved.

3. In the first place, some cheap mode of expelling the water by pressure or otherwise, and the addition of some dry absorbent powder, are wanted to fit the sludge for its passage through Mr. Kidd's machine, which it ought not to enter with more than about 60 per cent. of moisture, while sludge is taken out of the tanks, in which it is deposited or chemically precipitated, with about 90 per cent. or more of water.

4. In the experiments which have been carried out at Wrexham, this necessary reduction in proportion of moisture has been effected by spreading the sludge in thin layers on the ground for three weeks or more, turning it over and chopping it out with a spade with some fine ashes or other dry materials; processes which involve labour, and what is a much greater objection, viz., the necessity of keeping a very large superficial area available on which to spread out the sludge for a longer or shorter period of air drying, according to the weather.

5. It must also be borne in mind that the drying process is by no means complete after the sludge has left the machine, and that it must remain in a heap for a month or so before the whole is reduced to about 20 per cent. of moisture; but, as the heap can be piled up to a great height, the superficial area required for its storage is a very minor objection as compared with that involved in the preliminary air-drying.

6. During four months (March to June, 1877), 86 tons of dried sludge were produced, and sold at 10s. per ton, or about one-third of its analytical value; and, the conditions seeming favourable for establishing an artificial manure trade on a small scale at Wrexham, I undertook to compound, for the season 1877-8, a manure, called the "Farmer's Friend," consisting of 12 parts of the dried sludge, seven parts fine French bone meal, and one part sulphate of ammonia, which ought, I believe, when sold at £6 10s. per ton, to give the farmer at least as good value for his money as he receives from the best manure merchants at £8 per ton.

7. At any rate, I can say that more than 120 tons of this "Farmer's Friend" have been sold since that compound was introduced (October, 1877), and that, if the reports of the practical farmers now trying it prove favourable, it will be possible, in view of a probably increased demand next season, either to reduce the price, or to increase the value of the manure without sacrificing a reasonable profit on the business. But, in thus putting on record the results of the trial at Wrexham, I have thought it right to guard against the inference which might be drawn, that, because I have succeeded in drying and selling a small quantity of sludge at a profit, the same or greater profit may be made on a larger scale elsewhere.

Exhibition of Sanitary and Water Supply Appliances.

CATALOGUE.

1. Atkins, F. H., and Co., 62, Fleet-street, London, E.C.—Patent pure charcoal block filters in various forms. Models of arrangements for filtering large quantities of water. (See advertisement.)

2. Banner, E. G., 11, Billiter-square, London, E.C. — Patent ventilating cowls, traps, drain-pipes. Models illustrating Banner's system of sanitation. (See advertisement.)

3. Barff, Prof., 100, Abbey-road, London, N.W. —Specimens of pipes, traps, &c., treated by his process for the prevention of corrosion.

4. Beck and Co., 130, Great Suffolk-street, London, S.E.—Sluice valves, fire-cocks stop-cocks, and bib-valves. Model of anti-freezing pump. Miniature stand post with self-closing valve. Hydrants.

5. Bowing's Patent Filter Press Company, 184, Gresham-house, Old Broad-street, London, E.C.—Model of filter press, with samples of water before and after filtration. (See advertisement.)

6. Boyle and Co., 100, Mitchell-street, Glasgow.— Patent self-acting air-pump ventilators. (See advertisement.)

7. Bradbury, W., 57, Lees-road, Oldham.— Patent improved portabe and sanitary bed commode.

8. Capper and Co., 69, Gracechurch-street, London, E.C. — Pearson's patent trapless "Twin Basin" water-closet. (See advertisement.)

9. Chesshire, E., 83, Newhall-street, Birmingham. —Patent sanitary interceptors.

10. Clarke, Daniel, Waterloo Foundry, Carlisle. —Young's combined ball valve, rain-water trap, combined ventilating grate and lamp holes, gullies, &c. (See advertisement.)

11. Cliff and Sons, Wortley, Leeds.—Pott's patent Edinburgh air-chambered sewer trap.

12. Crossley, D., Brighouse, Yorkshire.—Patent improved self-acting noiseless ventilators.

13. Crowle Charring Co., 12, Dartmouth-street, London, S.W.—Samples of charring peat.

14. Davis and Co., 90, Crampton-street, Newington-butts, London, S.E.—A B C water testing apparatus.

15. Dodd, John, Thames-street, Liverpool.— Printed "A" patent ventilating water-closet; white "B," patent ventilating water-closet. Patent drain trap. (See advertisement.)

16. Doulton and Co., High-street, Lambeth, London, S.E.—Sanitary stoneware, Field's patent flush tank, Stanford's patent joints, Mansergh's trap, gullies, &c. (See advertisement.)

17. Durham, F., and Co., 147, Queen Victoria-street, E.C.—Improved high pressure steam and water cocks for preventing waste of water and steam. (See advertisement.)

18. Gardner, 453 and 454, Strand, London, W.C. Major Crease's patent rapid contiuuous water supply filter, to be attached to water main, and requiring no cistern. A modification of this filter has been adopted by the Army Medical Department for field hospital service; Major Crease's patent earthenware filter for domestic use, made in sizes from two gallons upwards. (See advertisement.)

19. Greenhill, William, 1, Queen-street, Twickenham.—Improved drain-trap.

20. Goodwin, R., Chesterfield.—"Perfect" stench and vermin proof trap, with mud-box and arrangements for keeping drains free from rubbish, also loose slide to admit of the whole being thoroughly cleansed when required. Sectional model of ditto.

21. Haresceugh, B. B., and Co., Bentinck-street, Leeds.—Patent spring lid excreta receptacle. Large and small ash-tubs. Sample of Haresceugh's carbolic acid disinfecting powder.

22. Harrison, Henry, Bletchley Iron Works, Fenny, Stratford, Bucks.—Patent dry stench trap.

23. Hart, Son, Peard, and Co., 53, Wych-street, London, W.C.—Various forms of ventilators.

24. Hodges and Butler, East Greenwich, Kent.—Drain pipes and paving slabs of silicated stone.

25. Ingham and Sons, Wortley, Leeds.—Sanitary stoneware; McLandsborough's patent double trap gully; Stanford's patent joints, &c. (See advertisement.)

26. Johnson, Samuel, 14, Lander-terrace, Woodgreen, London, N.—Models of a patent automatic apparatus for disinfecting and deodorising water-closets and urinals; the same principle also applicable to filters.

27. Lambert and Sons, Short-street, Lambeth, London, S.E.—Double supply and water-waste preventing cisterns and valves, fire-cocks, self-closing and other valves.

28. Le Grand and Sutcliff, Magdala Works, 100, Bunhill-row, London, E.C.—Model of "Norton's" patent Abyssinian tube well driving apparatus.

29. Lloyd, Thos., The Square, Winchester.—Patent ventilator or air sucker; one in copper for the vent shafts from soil pipes and drains; one in strong zinc with glass top plate for the ventilation of buildings; one for the ventilation of railway carriages and closed vehicles. (See advertisement.)

30. London and General Water Purifying Company, 157, Strand, London, W.C.—Various forms of filters; water-testing apparatus.

31. McEvoy and Gayton, 24, Moorgate-street, London, E.C.—The "Bower" patent sewer-gas trap. (See advertisement.)

32. McLauchlan, F. H., 19, Dalyell-road, Stockwell, S.W.—Model of tenemented house for workmen's dwellings.

33. Moule's Patent Earth-closet Company, 5A, Garrick-street, London, W.C.—Various forms of earth-closet, in each of which earth, ashes, or charcoal may be used. (See advertisement.)

34. Muller, J., 30, Craven-street, Strand, London, W.C.—Patent water meter. (See advertisement.)

35. Oakes and Robinson, 7, Westminster-chambers, London, S.W.—Patent filter press, for rapidly and economically extracting moisture from the semi-fluid products of breweries, sewage precipitation works, potteries, sugar factories, chemical works, &c.

36. Parker, John, Woodstock, Oxford—Dry earth and ash-closets. (See advertisement.)

37. Pulsometer Engineering Company, 61 and 63, Queen Victoria-street, London, E.C.—Pulsometers of small size, to illustrate the use of the pulsometer in larger sizes for the lifting of liquid sewage without the use of a steam-engine.

38. Rawlings, H., 108, St. Martin's-lane, London, W.C.—Model illustrating upward filtration by "Excel" filter. (See advertisement.)

39. Sanitary Engineering and Ventilation Company, 115, Victoria-street, London, S.W.—Patent ventilating tubes, self-cleansing and aerating filters, improved glass table filter.

40. Scott, Dunn, and Co., 114, Cannon-street, London, E.C.—Patent exhaust cowls and traps.

41. Scott's Sewage Company.—Cement manufactured from sewage at Burnley.
    (1.) The raw effluent which varies every hour.
    (2.) The limed effluent undergoing precipitation.
    (3.) Cement made from the sludge precipitated.

42. Silicated Carbon Filter Company, Church-road, Battersea, London, S.W.—Silicated carbon filters in various forms.

43. Sinclair, Jas., 104, Leadenhall-street, London, E.C.; Berton, Furstenhagen and Wilts "Indispensable" patent double acting high pressure filter.

44. Smeaton and Sons, 24, Moorgate-street, London, E.C.—Patent trapless water-waste preventing and regulating closet, in one pan of earthenware under the closet seat.

45. Spencer, J., 97, Cannon-street, London, E.C., and West Bromwich, Staffordshire.—Enamelled tubing for sanitary purposes.

46. Spongy Iron Water Purifying Company, 505, Oxford-street, London, W.C.—Bischof's spongy iron filters of various sizes and patterns. These filters are charged only with inorganic substances, the purifying medium being spongy (metallic) iron. (See advertisement.)

47. Stevens, C. R., 6, Sussex-terrace, Lee, Kent.—Self-acting double and single action ventilators and chimney cowls.

48. Stott, Henry, West-vale, Greetland, Halifax.—Model illustrating Stott's patent system of sewer ventilation. Model of ventilators for ships.

49. Stiff, James, and Sons. London Pottery, Lambeth, London, E.C.—Stiff's "Interceptor" sewer-air trap. Weaver's ventilating sewer-air trap and air sucker, tulip wind-guard chimney cowl, and other sanitary stoneware. (See advertisement.)

50. Union Water Meter Co., 4, New Broad-street, London, E.C.—Water meter.

51. Waller, Thomas, and Co., 47, Fish-street-hill, London, E.C.—Patent apparatus for the ventilation of water-closets. (See advertisement.)

52. Warrington, Corporation of.—Specimens of tub for excrement, with cloth by which spilling is prevented.

53. Wilcock and Co., Rock Collieries, Burmantofts, Leeds.—Sanitary stoneware; Lund's gullies; Ward's patent ventilating street gulley. Dr. Woodhead's patent apparatus for preventing the entrance of sewer gas into dwellings.

INDEX.

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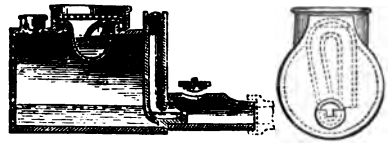

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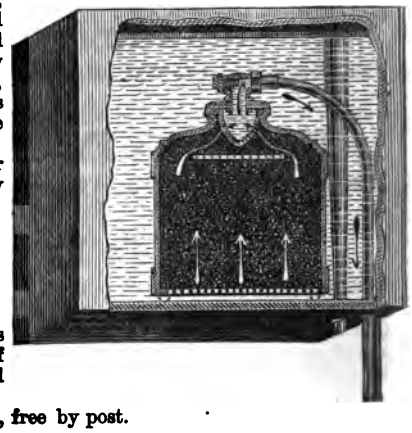

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"The least amount of *removal* of *organic matter* by your Filter has up to the last rendered water so filtered equal to the purest water of the Kent Company from the chalk springs, taken by Dr. Frankland in his reports as the standard of purity in water supply."

Dr. Bartlett's Report in prospectus, and every other information, free by post.

H. RAWLINGS,

PATENTEE AND MANUFACTURER,

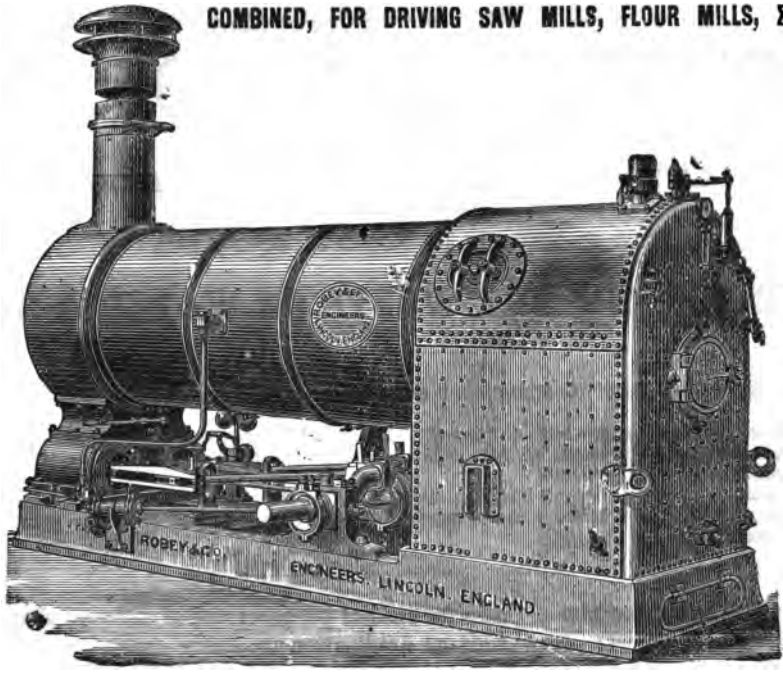
108, ST. MARTIN'S LANE, CHARING CROSS, W.C.

NEW DESIGN OF

Horizontal Fixed Engine & Locomotive Boiler

COMBINED, FOR DRIVING SAW MILLS, FLOUR MILLS, &c.

No expensive Brick-buildings and Chimneys required.



Boiler can be arranged to burn sawdust and refuse wood. Engines up to 200 Effective Horse-power always in progress.

ROBEY & CO., Sole Manufacturers, LINCOLN, ENGLAND.

LONDON OFFICES: 117, CANNON-STREET, E.C., WHERE THE ABOVE ENGINE AND OTHER MACHINERY OF R. & CO.'S MAKE CAN BE INSPECTED

MULLER'S
PATENT WATER METERS.

These Water Meters have been pronounced by the most competent authorities to be the best yet invented, being simple in construction, very accurate, and extremely sensitive, indicating the smallest flow of Water.

One of the largest Water Companies in the Metropolis has had one of these Meters in use for 18 months, and it has worked to the entire satisfaction of the Company's Engineer. Messrs. Russ and Minns write:—"We have formed the highest opinion of these Meters, and anticipate that they will be found to afford the much-needed means of determining fairly and economically the consumption of Water in all instances with as great accuracy as Gas is now measured to consumers by the best-constructed Gas Meters."

PRICES AND FURTHER INFORMATION TO BE OBTAINED AT

Muller's Patent Water Meter Company, Limited,

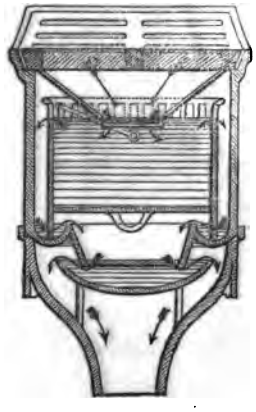
148, GRESHAM HOUSE, OLD BROAD ST., E.C.

DANIEL CLARK,

WATERLOO FOUNDRY, CARLISLE,

PATENTEE AND MANUFACTURER OF

Patent Stench Trapped Gullies; Latham's Patent Sewer Ventilators; Young's Improved Ball Valves, combined with Clark's Patent Gullies, for preventing the Flooding of Streets or Cellars; Penstocks;



Flushing Gates; Tidal or Flap Valves; Sluice Valves; Side Entrance Safety Gratings; Combined Manholes and Ventilating Grates; Charcoal Baskets, &c., &c.

Drawings and Prices of which will be forwarded on application.

WATER SUPPLY.

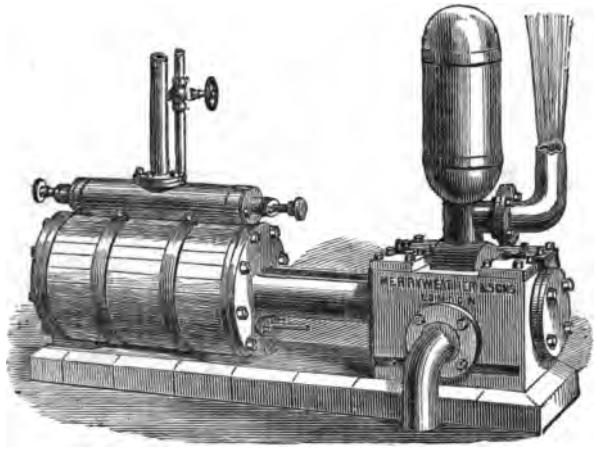
THE

COMPOUND "COAL-SAVING" STEAM PUMP

(FIELD & COTTON'S PATENT)

Expands the Steam five times, and is the most economical Steam Pump manufactured.

FOR WATER SUPPLY.



FOR SEWAGE PUMPING.

Particulars and prices may be obtained from

MERRYWEATHER & SONS,

FIRE ENGINE MAKERS AND HYDRAULIC ENGINEERS,

LONG ACRE, LONDON. Works: LAMBETH & GREENWICH.

"This Engine and Pump deserve the attention of Engineers and all who have much pumping to do. We have formed a very favourable opinion of it."—*The Engineer.*

Paris System for Watering Streets, MERRYWEATHER & SONS, Sole Makers.

Hydrants and Stand Pipes.	**Hose Reels, Branch Pipes, &c.**
Leather Hose (supplied by Merryweather and Sons to London Fire Brigade).	**Double-rivetted Leather Hose. Merryweather's speciality.**
Jacket "High-pressure" Hose will stand 600 feet head.	**Pumping Machinery for Towns or domestic purposes.**
Canvass and India-rubber Hose.	
Tanned Inlined Canvass Hose (used by the London Fire Brigade).	**Merryweather's Illustrated Catalogue; 500 illustrations; 100 pages; price 3s.**

Fire Engine Makers to the English, French, Russian, and other Governments; to the London, Liverpool, Manchester, Bristol, Belfast, and the chief Fire Brigades in the Kingdom.

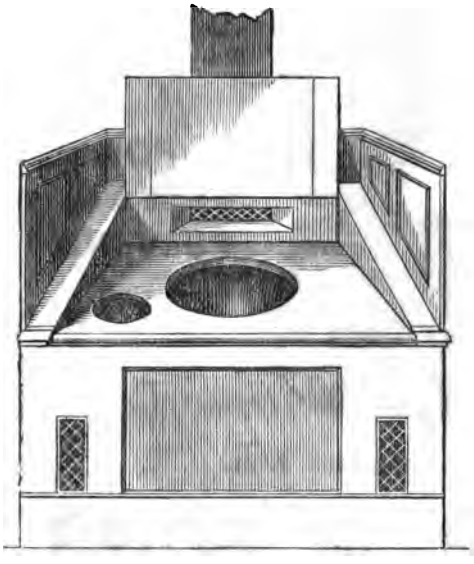
THOMAS WALLER'S

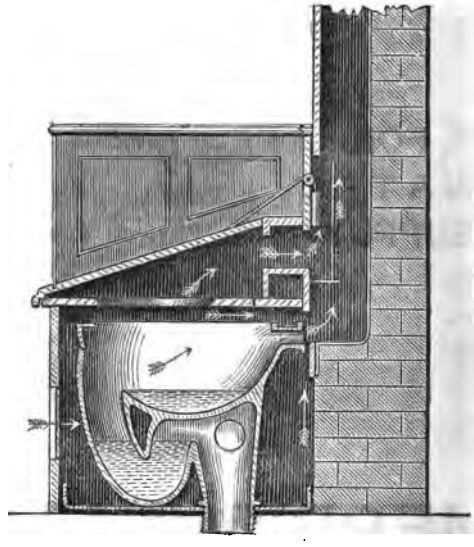
PATENT VENTILATING APPARATUS.

The object of this Invention is to thoroughly Ventilate Water Closets.

It prevents Sewage Gas, and other offensive smells, entering the dwellings through the Water Closet. By fixing a tube or duct back of the Water Closet, with an open mouth extending above and below the seat, the Sewage Gas, which enters the Closet through defective joints in Soil Pipes or Syphon Pipes (which frequently become dry), are entirely carried away by the Ventilating Shaft, through and above the roof of house.

The flap, or cover, being fixed on an incline, acts in the same manner as a blower to a fire-place. This Ventilator is equally suitable for Hospitals and Sick Rooms, by connecting the Ventilating Tube with the chimney or fire-place.





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Engineers, Smiths, Gas Fitters, Stove Manufacturers,

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RULE-JOINTED FIRE BRICK, AND SMOKE-CONSUMING STOVE, REGISTER AND OTHER STOVES, STEAM CHESTS, &c.

PUBLIC AND PRIVATE KITCHENS

Fitted up on the most improved principle, with open or close Kitchen Ranges, Hot Plates, Steam Closets, Cutting Dishes, Copper and Block-Tin Steamers, Lifts, &c.

Kitchen Fittings altered, re-arranged, and repaired on the shortest notice. Public and Private Buildings Heated by hot Air or Water. Hot and Cold Baths Fixed.

Metal Conservatories, Iron Houses and Roofs—Plain or Corrugated. Drying Rooms Erected, and Heated by the Patent Drying Apparatus. Smoky Chimneys Effectually Cured.

Wine Bins Erected on an Improved Principle. Experienced Workmen sent to all Parts of the Kingdom.

47, FISH STREET HILL, E.C.

Manufactories:—Ratcliff Iron Works, Rose Lane, Ratcliff, E., London; and the Grove, Southwark Street, S.E

BOYLE'S PATENT

SELF ACTING

AIR-PUMP VENTILATORS

Consist of four sections, each acting independent of the other; the external air impinging on the louver plates (or diaphgrams), is deflected at different ngles over the central radial plates, and in passing out exhausts the internal chambers, creating a partial vacuum. The foul air immediately rushes up the shaft (connecting the ventilator with the place being ventilated) to supply the place of the air extracted, thus securing a continuous powerful upward current, and no down-draught.

Testimonial from Sir WILLIAM THOMSON, LL.D., Professor of Natural Philosophy, Glasgow College.

Glasgow College, 29th March, 1872.

I have seen several different forms of Mr. BOYLE's Air-Pump Ventilator in actual operation, and have much pleasure in testifying to their efficiency. They thoroughly realise the favourable anticipations which I formed from experiments on models shown to me by Mr. BOYLE. Having one fitted up in my yacht, I find it has caused a very decided improvement in the draught. WILLIAM THOMSON.

Boyle's Perfect System of Ventilation.

CHURCHES, HALLS, SCHOOLS, MANSIONS, FACTORIES, STABLES, &c., Ventilated on scientific principles, and in accordance with the laws of nature by means of BOYLE'S PATENT SELF-ACTING AIR-PUMP VENTILATORS, which effectually extract the foul air, have no mechanical motion, and are entirely free from down-draught and noise; improved appliances for admitting fresh air—warm or cold—without draughts or currents.

Dr. B. W. RICHARDSON, F.R.S., in his lecture, "Health of Great Cities," referring to the Air-Pump Ventilators, says, "Since these excellent Ventilators have been introduced we have got *perfect* methods of Ventilation."

BOYLE'S PERFECT SYSTEM of SANITATION.

SOIL-PIPES, DRAINS, and SEWERS ventilated on the most improved principles, by BOYLE'S PATENT SELF-ACTING AIR-PUMP VENTILATORS, combined with an IMPROVED TRAP and INLET for fresh air.

"I have often made use of the Air-Pump Ventilator for soil-pipes, &c., and consider it most admirable. Its action is continuous, and *cannot possibly get out of order*. It is decidedly the most efficient fixed foul-air withdrawing medium I ever met with."—W. EASSIE, Esq., C.E., F.L.S., &c., London, Author of "Healthy Houses," &c

"BOYLE'S Patent Self-Acting Air-Pump Ventilator, which does not revolve, is the best Soil-Pipe Ventilato. that I know of."—ERNEST TURNER, Esq., F.R.I.B.A., &c.

ROBERT BOYLE AND SON,

PATENTEES AND MANUFACTURERS.

OFFICES AND SHOW-ROOMS:—

100, MITCHELL-STREET, GLASGOW,

AND

MANSION-HOUSE-BUILDINGS, LONDON.

BRANCH—8, CORPORATION-STREET, MANCHESTER.

WORKS—154½, BOTHWELL-STREET, GLASGOW.

DIPHTHERIA AND TYPHOID FEVER PREVENTED

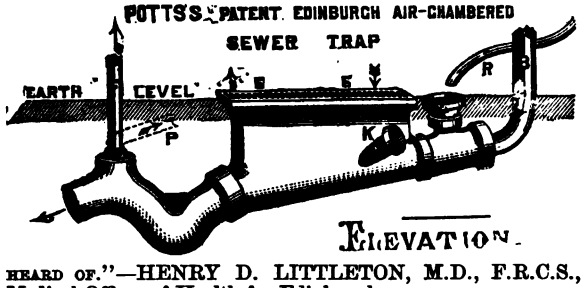
BY THE

Edinburgh Air-Chambered Sewer Trap.

THE SIMPLEST, CHEAPEST, AND MOST PERFECT TRAP.

CAN BE EASILY FIXED BY THE MOST INEXPERIENCED BRICKLAYER, AND IS GUARANTEED TO ENTIRELY PREVENT SEWER GAS FROM ENTERING HOUSES.

Approved of and Recommended by { Robert Rawlinson, Esq., C.B., Local Government Board, Whitehall; Dr. Richardson; Dr. A. Carpenter; Dr. Littlejohn; Dr. Axford; Dr. Finlay; Dr. Welch; W. Eassie, Esq., C.E.; E. Turner, Esq., C.E.; A. Carter, Esq., C.E.; Dr. Dukes; and all the Highest Sanitary Authorities in Great Britain.



ELEVATION.

"All the sanitary appliances, whether connected with refuse water conveniences or the ordinary water supply, are entirely disconnected from any direct junction with the drains, and thus the possibility of the entrance of Sewage Gases by any Channel into the Building is entirely prevented. The plan is simple, not costly, &c.....The system in question can be applied to houses, whether detached or otherwise, *and I feel certain that, if it were extended to all houses in connection with Drains, such* Diseases as Diphtheria and Typhoid Fever would be rarely heard of."—HENRY D. LITTLETON, M.D., F.R.C.S., Lecturer on Public Health at Surgeon's Hall, Medical Officer of Health for Edinburgh.

"It is perfect in its simplicity a sa Sewer Trap, &c."—CLEMENT DUKES, M.D., &c., Medical Officer, Rugby School, &c.

Prices and Particulars on application to

POTTS & CO., HANDSWORTH, BIRMINGHAM;

OR TO

Messrs. CLIFF & SONS, London, Leeds, and Liverpool.

SOLE MAKERS FOR ENGLAND AND WALES.

Important to Local Boards and Others.

UTILISATION OF NIGHT SOIL.

MILBURN'S SYSTEM

FOR

TREATING AND DRYING NIGHT SOIL,

Economically converts it into a rich, pulverulent Manure worth from £5 to £8 per Ton.

For Particulars apply to

MILBURN'S ENGINEERING COMPANY,

LIMITED,

Metropolitan-buildings, 63, Queen Victoria-street, London, E.C.

SEWAGE UTILISATION

AND

Prevention of Rivers Pollution.

TO TOWN AUTHORITIES.

The success of BOWING'S PATENT FILTER PRESS in dealing with large volumes of Sewage Sludge, Impure Water, &c., without the application of HEAT is fully established.

THE EFFLUENT WATER IS CLEAR AND THE RESIDUUM DRY.

The Company is prepared to undertake Contracts for the Treatment of any quantities, however large, of Sewage Sludge, Impure Water, &c.

For terms and orders to view the BOWING PATENT FILTER PRESS DRYING SEWAGE SLUDGE apply to the Managing Directors of

BOWING'S PATENT FILTER-PRESS CO.

LIMITED (Messrs. WARD & BOWING),

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LONDON, E.C.

MODEL FILTER PRESS EXHIBITED AT THE SOCIETY OF ARTS ROOM DURING THE SANITARY CONFERENCE.

LLOYD'S

IMPROVED PATENT VENTILATOR

CERTIFICATE OF MERIT AWARDED AT MANCHESTER AND SALFORD SANITARY EXHIBITION, AUGUST, 1877.

BY ROYAL LETTERS PATENT.

Can be applied to the Ventilation of every Class of Building, extracting all vitiated air from Churches, Chapels, Law Courts, Assembly Rooms, Barracks, Infirmaries, Prisons, Factories, Workshops, Schools, Kitchens, Stables, &c.

Also specially arranged for the Ventilation of Railway Carriages and all Closed Vehicles, and to the Ventilating Shafts from Drains and Sewers, and is constructed to prevent down draught in Chimneys.

Under are a few of the Buildings where Lloyd's Improved Patent Ventilator is already Used:—

The Guildhall, Bath.
St. Peter's Church, Clifton, Bristol.
Edge Church, near Stroud, Gloucestershire.
Hyde Church, Winchester.
Board Room, Portsey Island Union House.
Hursley Union House (Laundry).
Reading Room, Mechanics' Institute, Winchester.
Iron Church, Guildford, Surrey.
Royal Hotel, Winchester.
St. Michael's Church, Winchester.
St. Lawrence Church, Winchester.
St. Maurice Church, Winchester.
The Training College, Winchester.
Saracen's Head Hotel, London.
Billiard Room, County Club, Winchester.
Old Town Hall, Manchester.
St. George's Church, Worcester.
Philharmonic Restaurant, Cardiff.
Local Board Stables, Winchester.
Chernock House, Winchester.
Southgate House, Winchester.
Winton House, Winchester.
St. Maurice Hall, Winchester.
Central Schools, Winchester.
St. Swithin's Home, Winchester.
Town Hall, Alton.

And in Numerous Private Establishments, Business Premises, Schools, Kitchens, Laundries, Stables, &c.

TESTIMONIALS:—

FROM CHARLES E. DAVIS, F.S.A., CITY ARCHITECT, BATH.

May 22nd, 1877.

The introduction of pure air on the Tobin principle, added to the extraction of the foul air by Mr. Lloyd's Air Sucker, is the only complete means of ventilation I am acquainted with.

I have in this way successfully ventilated many large rooms, amongst which I may mention the Justice Room, Guildhall, Bath.

CHARLES E. DAVIS, F.S.A.

FROM ERNEST A. DAY, ARCHITECT, SANITARY AND VENTILATING ENGINEER, WORCESTER.

5, Foregate-street, Worcester, September 27th, 1877.

Dear Sir,—I have much pleasure in bearing my testimony to the value of your Patent Extract Ventilator. The Ventilator being worked by atmospheric pressure, causes a vacuum in pipe, and thereby draws away the air, smoke, dust, or steam from underneath; its simplicity and peculiar construction prevents down draughts, which are the great and serious inconveniences attending nearly all ceiling or extract ventilators.

Yours faithfully,

ERNEST A. DAY.

To Mr. Thomas Lloyd, Winchester.

THOMAS LLOYD,

Patentee and Manufacturer, Ventilating and Sanitary Engineer,

WINCHESTER.

SILVER MEDAL and DIPLOMA,

BRUSSELS, 1876.

Established 1858.

NO GOODS **Genuine** WITHOUT

Established 1858.

THE **Trade Mark** AFFIXED.

MEDAL FOR MERIT.

LONDON, 1874.

JAMES HOWORTH'S

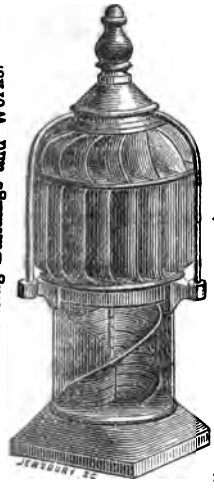
PATENT REVOLVING

ARCHIMEDEAN SCREW VENTILATORS

Are universally acknowledged to be the BEST and CHEAPEST for securing effective Ventilation in

Mills, Weaving Sheds, Gassing Rooms, Sizing Rooms, Drying Stoves, Bleach Works, Dye Houses, Buildings, & Works of every description.

For Ventilating Buildings and Works.



No. 1.

THESE VENTILATORS are of various Sizes, suitable for all kinds of Public Buildings, Churches, Houses, Schools, Stables, and Works of every description. They secure perfect Ventilation without down draught; continue in good working order for eight to twelve years and upwards, without requiring any attention; and afford an effectual means for the cure of Smoky Chimneys and the Ventilation of Sewers. By the operation of the Screw, a continuous up-current is produced, by which means hot vitiated air, steam, or dust is removed from the room, and the possibility of a down draught is prevented, the twofold advantage thus secured being thorough Ventilation without draught.

The Centres of these Ventilators are of the most delicate character, and revolve on an imperishable substance; their durability and perfect means of lubrication have proved unequalled; thousands can be found which have required no attention for upwards of twelve years.

The following Noblemen and Gentlemen have my No. 1 and 4 Ventilators working on Private Residences, Works, and Estate Buildings:—

The Duke of Bridgewater.	The Duke of Devonshire.	Lord Radnor.
The Duke of Sutherland.	The Duke of Rutland.	Viscount Gough.
The Duke of Hamilton.	The Earl of Bradford.	Lord Leconfield.
The Duke of Buccleuch and Queensbury.	The Earl of Ellesmere.	Sir A. de Rothschild.
The Duke of Cleveland.	The Earl of Kinnoul.	Sir Titus Salt.
	The Earl Fitzwilliam.	Sir E. Armitage.
	The Earl of Glencarty.	

And thousands of Clergy and Gentry. They are also extensively adopted on Government Works, viz., Spithead, Portsmouth, and Portland, India, and other Home and Colonial Establishments; and by the Sanitary Authorities for the Ventilation of Sewers and Hospitals, Town Halls, Prisons, Asylums, Stables, &c.

No. 4.

For Smoky Chimneys.

References for No. 1 Ventilators.—Messrs. J. PULLAR & SONS, North British Dye Works, Perth, have the following numbers and sizes of No. 1 Ventilators at work on their works at Perth, for abstracting steam —7, 16-inch; 40, 24-inch; 1, 30-inch.——The *Times* Newspaper Office, Printing House-square, London, E.C., has three of No. 1, 39-inch, to ventilate the Printing House.——Messrs. HORROCKSES, MILLAR, & Co., Cotton Spinners and Manufacturers, Preston, have 24 of No. 1, 14-inch, and 30 of No. 1, 18-inch, for ventilating their mills and sheds.

References for No. 2 Ventilator. By Power.—Sir TITUS SALT, SONS, & Co., Saltaire, near Bradford, Yorkshire, have seven No. 2, 24-inch, and one No. 2, 36-inch, for ventilating and taking away hot air.——Messrs. HENRY HANSON & SONS, Stockport Ropery, Flax Mills, Stockport, have 26 of No. 2, 24-inch, for taking away dust from the card-rooms in their mills.——Messrs. J. PULLAR & SONS, North British Dye Works, Perth, have five of No. 2, 30-inch, for taking away steam.——Mr. J. E. BRADLEY, Kebroyd Mills, near Halifax, has four of No. 2, 30-inch, for gassing-room.

For a scientific and successful application of the Revolving Archimedean Screw Ventilators, qualified by 20 years' study and practical experience in their application to every kind of Buildings, Works, and Sewers, apply, giving internal size of Building, to the Sole Maker,

JAMES HOWORTH,

CONSULTING & VENTILATING ENGINEER,

VICTORIA WORKS, FARNWORTH, near Bolton and Manchester, ENGLAND.

WM. SMEATON & SONS,

SANITARY ENGINEERS,

24, MOORGATE STREET, E.C.,

9 and 10, WYCH STREET, and 9, NEWCASTLE STREET,

STRAND, LONDON,

Respectfully invite attention to their various improvements of Sanitary Appliances for preventing the waste of water, and more especially Sewer Gases from entering dwellings.

SMEATON & SON'S PATENT TRAPLESS WATER-WASTE PREVENTING AND REGULATING WATER-CLOSET, in one piece of Porcelain, is the only Closet possessed of the following improvements:—

Price £5 10s.

Fancy or Gilt extra.

1st. It is the *only* TRAPLESS CLOSET having no connection between the overflow and soil-pipe or drain.

2nd. It insures a perfect after-flush, however long the handle may be kept up.

3rd. It is a perfect water-waste preventer, in one piece of Porcelain, under the seat.

4th. It can be fixed on properly constructed open soil-pipes without a trap, or on the ordinary soil-pipes with trap under it.

5th. Where water is plentiful it can be regulated to flush as desired, or give just the necessary quantity.

6th. No soil can enter the Ball Chamber.

7th. Being perfect in itself, it requires no lead safe.

8th. It has a solid earthenware plug.

VAL DE TRAVERS

COMPRESSED ROCK ASPHALTE,

As laid in the Roadways of Cheapside and a hundred other Principal Streets of London and in many Provincial Towns.

The best and most durable Pavement ever introduced.

Val de Travers Compressed Rock for footways as laid in the Strand, round the garden of Leicester-square, and in many metropolitan and provisional parishes, and selected by the Commissioners of Sewers of the City of London for the footways of Cheapside, Poultry, Moorgate-street, and several of the street of exceptionally heavy traffic, is as durable as flagging, far more agreeable to pedestrians, possesses far greater sanitary advantages, and cost one-third less.

VAL DE TRAVERS MASTIC ASPHALTE IS SPECIALLY ADAPTED FOR—

Stables.	Railway Platforms.	Drying Sheds.
Roofings.	Cow-houses.	Wharves.
Coach-houses.	Warehouses.	Malt Floors.
Water Tanks.	Brewhouses.	Barns.
Granaries.	Basements.	Lavatories.
Reservoirs.	Corridors.	Cells.
Sewage Tanks.	Playgrounds.	Works, &c.

IT IS FIRE PROOF, DAMP PROOF, AND VERMIN PROOF, AND UNAFFECTED BY ANY CLIMATE.

Skating Rinks and Tennis Courts are laid, both under cover and in the open, and the asphalte is specially prepared for this purpose.

SPECIAL ARRANGEMENTS MADE WITH PUBLIC BODIES, FOR PAYMENT BY BONDS WHEN DESIRED.

Full Particulars, Prices, Testimonials, Samples, &c., to be had on application to the

Val De Travers Asphalte Paving Company

(LIMITED),

14, 15, and 16, Palmerston-buildings, Old Broad-street,

LONDON, E.C.

Medals awarded—Vienna, 1873; Brussels, 1876; Philadelphia, 1876.

MAJOR CREASE'S

PATENT

GRANULATED CARBON FILTER,

ADJUSTABLE AND READILY CLEANED;

SELECTED AND USED EXCLUSIVELY

BY

THE ARMY MEDICAL DEPARTMENT;

UNIVERSALLY ADOPTED IN

The Royal Navy; East Indian and English Transport Services; the German, Russian, American, and Austro-Hungarian Navies;

ALSO BY

HER MAJESTY'S WAR DEPARTMENT

FOR

BARRACKS, HOSPITALS, & ARMY FIELD SERVICE.

MANUFACTURERS—

GARDNERS,

453 & 454, STRAND; 3 & 4, DUNCANNON STREET;

GOLDEN CROSS YARD;

AND

112, ST. MARTIN'S LANE, LONDON, W.C.

Full particulars by post on application.

DRY EARTH AND ASH CLOSETS,

MANUFACTURED BY

JOHN PARKER,

OF WOODSTOCK, OXFORD.

They are Suitable in the House or out—Portable or Fixed—the Cheapest and Best Dry Closet made.

SEND FOR A PROSPECTUS.

TESTIMONIALS:—

London International Exhibition, 1874.—The Only Medal for Dry Closets was awarded to these.

Social Science Association Exhibition at Norwich.—"Certificate of Merit."

Sanitary Association of Great Britain Exhibition at Leamington.—The Only Medal given.

And Medals at Manchester, Chester, Preston, and Stalybridge.

They Keep the Place Sweet and Wholesome.

OXYCHLOROGENE,

A Powerful and Complete Deodoriser, Antiseptic, and Disinfectant.

This Fluid is prepared strictly in accordance with the most recent researches in Chemical Science, and is practically the most perfect Disinfectant and Deodoriser ever introduced. It is entirely free from anything of a poisonous nature, and may be used with the greatest confidence either in the sick chamber or for the destruction of infectious germs, offensive odours, or impurity of any kind. It has no unpleasant odour, and when diluted does not stain, therefore may be freely used without the least fear of injury in its application.

May be obtained of all Chemists and Medicine Vendors in the Kingdom. In Bottles at 1*s. and* 2*s.* 6*d. each, and in Bulk at* 8*s. per Gallon, with full directions for use.*

PATENT POTASH SOAP,

For use in Cold or Lukewarm Water. One 1 lb. is equal to 2 lbs. of best yellow soap.

It is the Best and Cheapest Soap for Laundry Purposes. It is warranted not to injure the most delicate material. The PATENT POTASH SOAP possesses cleansing properties far in advance of any other soap, and by the new process of washing in cold water, according to the directions given, the dirt is dissolved and discharged from the fabric with very little rubbing, while the clothes are thoroughly cleansed and rendered pure and white at much less cost, and in half the time of the usual process of washing. The annoyance of steam is avoided, the clothes are not worn or torn, and no soda, washing, or bleaching powder being used, they are not injured or destroyed. One trial will lead every household to abolish the old and destructive system of washing. The PATENT POTASH SOAP acts admirably in any description of washing machine.

Of all Grocers and Oilmen in Bars 6*d. per lb., or* 1 *cwt. Boxes* 52*s.*

PATENTEES AND SOLE MANUFACTURERS—

MACKEY, SELLERS, AND CO.,

WHOLESALE MANUFACTURING CHEMISTS,

1 and 2, BOUVERIE STREET, FLEET STREET, LONDON.

ESTABLISHED 1830.

SLACK AND BROWNLOW,

WATER ENGINEERS,

MAKERS OF

FILTERS FOR COUNTRY RESIDENCES,

VILLAGE WATER SUPPLY,

PUBLIC BATHS,

AND

GENERAL MANUFACTURING PURPOSES,

AS SUPPLIED TO THE

EARL OF ELLESMERE, UPHOLLAND LOCAL BOARD, COLINTON LOCAL BOARD,

THE

WAKEFIELD CORPORATION BATHS, &c.

ESTIMATES AND REFERENCES FREE ON APPLICATION.

CANNING WORKS, MANCHESTER.

STANFORD'S PATENT JOINT, as applied to Sanitary Pipes.

W. INGHAM & SONS, Sole Makers for the Counties of York, Lincoln, Nottingham, & Durham.

WORTLEY, NEAR LEEDS, MANUFACTURERS OF THE FOLLOWING ARTICLES OF THE HIGHEST QUALITY IN FIRE CLAY:—

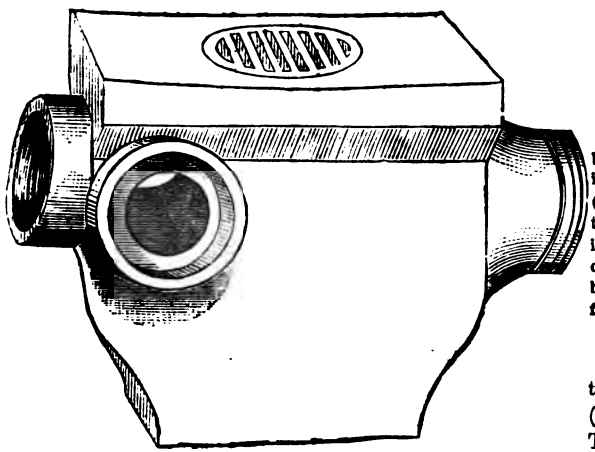
BLACK GLAZE. Fire Bricks. Blast Furnace Linings. Glazed Sanitary Pipes. Malt Kiln Tiles.

WHITE GLAZE. Gas Retorts by Hand or Machine.

BLUE GLAZE. Terra Cotta. Glazed Bricks & Tiles. White Facing Bricks. Glazed Cattle Troughs.

BUFF GLAZE. Vitrified Red Bricks for Buildings and Pavements.

And of Stanford's Patent Joint, McLandsborough's Patent Double Trap-Gully, Mansergh's Trap, and other most approved Sanitary Appliances.

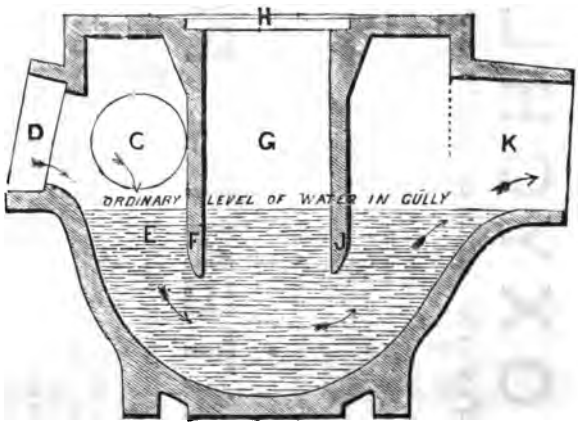


McLandsborough's Patent

DOUBLE-TRAPPED VENTILATING GULLY,

For House and Surface Drainage.

Sewer gas passing up the drain into gully at K is obstructed by the trap or dip J. If from any cause the gas should force its way under this trap, it will ascend the ventilating chamber G, and escape through the grate or ventilating-pipe at H into the open air. The trap F prevents any sewage gas being drawn into the dwelling through the inlets B and C. The inlet chamber E, and the drains terminating therein, are ventilated by the untrapped rain water-pipe entering at D, which also flushes the gully in the direction of the drain.



W. INGHAM & SONS have separate works for the manufacture of articles in Red Clay, viz., Bricks (Common, Facing, and Ornamental), Roof and Floor Tiles, Terra Cotta, &c.

Leeds Office—Infirmary Street. Hull Office—Queen's Dockside. London Office—19, Laurence Pountney Lane, E.C.

THE PATENT
"WASH OUT" CLOSET.

The difference between this Closet and others with water in the bottom to receive the soil, is that in them you depend upon the water *floating* the soil and paper out of the basin, or have a *discharge valve or plug* placed between the basin and the trap to retain the water in the basin. The objection to the former is that the soil, &c., is frequently left in the basin, and to the latter that the soil adheres to the valve, stopping its proper working, and impregnating the water in the basin. By the "**Wash out**" arrangement both these evils are avoided. The water is so directed in entering the basin that it makes at once for the outlet, **driving** before it the soil and paper out of the basin and through the trap, leaving pure water to fill the basin. There is no metal or valves of any kind exposed to the action of the soil. It is important to have an $1\frac{1}{4}$-inch service pipe. It can be fixed in the place of any ordinary closet. This Closet is designed to meet the requirements of the two gallons service.

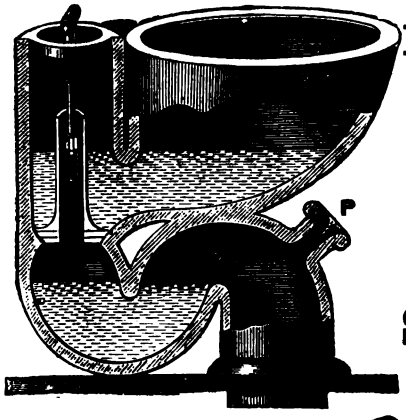
The ventilation of the traps for these Closets is also provided for (*when so ordered*), by a pipe of $2\frac{1}{4}$ inches diameter; this opening can also be used as a means of unstopping the trap should it ever need it. The trap is made to trap fully one inch, and thus an efficient trap is secured.

Extract from the *Architect* of June 9th, 1877, page 373. "How to Drain a House," from a paper by T. Mellard Reade, Esq., C.E., read before the Liverpool Architectural Society:—

> "I consider the pan-closet objectionable, especially since the compulsory introduction of the two-gallon regulating cistern has increased the difficulty of getting the after flush to fill the pan. The 'Container' is usually a reservoir coated with filth, hidden by the pan holding the water in the basin. A basin with a trap at the side or back, called a '**Wash out**' basin, is a far bettter apparatus."

JAMES WOODWARD,
MANUFACTURER,
SWADLINCOTE, near BURTON-ON-TRENT.

Improved Sanitary and Building Appliances.



Baths, Lavatories, Water Closets,

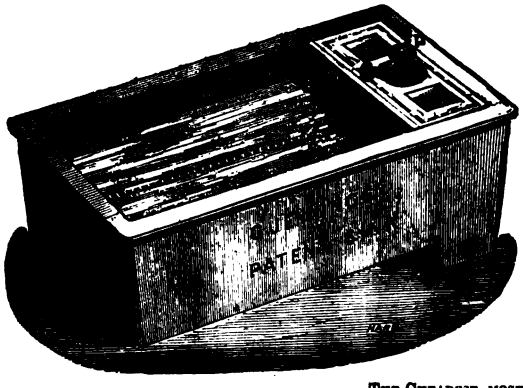
HOUSEHOLD, SCULLERY,

AND

SLOP SINKS;

URINALS, PUMPS,

Sluice Valves, & Water Fittings.



JENNINGS' PATENT VALVE CLOSET and TRAP.

In One Piece of Earthenware. Over 47,000 in Use.

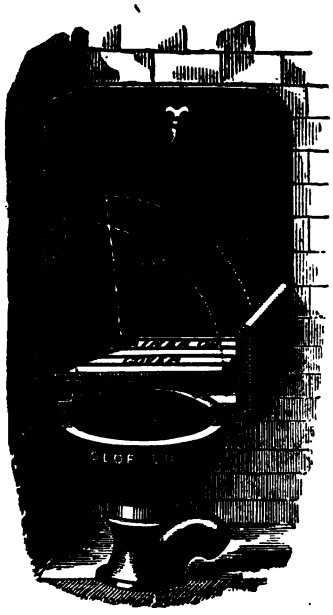
These Closets are now so widely known that any description is unnecessary. It should, however, be noted, that they are now supplied by a New Regulating Surface Valve, suited to any pressure of water, from main or cistern, and closing with a weight, instead of a float, as heretofore used.

The Socket, **P**, for air-pipe on Trap outlet, is also an addition of great value, preventing the trapping water absorbing and giving off sewer gases into the house; it relieves the hydraulic seal from all pressure, and prevents the syphon action due to a discharge down a contracted soil-pipe.

Price, from 70s. upwards. Socket, P, 10s. extra.

JENNINGS' NEW PATENT TRAPLESS VALVE WATER-CLOSET.

In its various qualities Suited for the Cottage or Mansion.



THE CHEAPEST, MOST EFFICIENT AND COMPACT CLOSET EVER PRODUCED, requires no lead D or other Trap, and therefore cannot become stopped, or dangerous to health from a defective syphon. It is provided with solid plug, **P**, to retain water in basin, a socket, **V**, for ventilating pipe, and a trapped overflow, **T**, with connection, **W**, for lavatory or other waste-pipe.

The new supply valve works equally well under any pressure, and has two deliveries, one to the closet basin and the other into the overflow trap, each time the handle is raised.

Price, from 60s. upwards.

JENNINGS' IMPROVED PATENT SINKS.

For Kitchens, Sculleries, Pantries, and Artisans' Dwellings.

A Sink is necessary to every house, and its value is increased by the variety of purposes for which it is adapted. The Improved Sink answers in every respect all the requirements of an ordinary household sink, and also forms an excellent and convenient Tub;—for the cook, for the plates, dishes, vegetables, &c.; for the housewife, for her linen; for the butler (lined with pine), for plate, china, and glass; and for the labourer's wife, the additional purposes of a child's bath, or a lavatory for her husband on his return from work.

Price, from 40s. upwards.

JENNINGS' PATENT TIP-UP LAVATORIES.

These Lavatories are to be found in nearly every Club, Hotel, Bank, Asylum, Union, and other Public Building, and thousands of Private Dwellings in London and the Provinces, and can be made to any dimensions or design. They are to be preferred to basins discharged through plughole, for cleanliness, durability, and simplicity: they leave no filthy deposit on the interior of the basin, and the loss of brass plugs and the breaking of chains are altogether avoided.

Prices, complete, from 63s. per basin and upwards.

PATENT SLOP SINKS.

For Closets on Bedroom Floors.

Made to suit any position in Plain or Enamelled Slate.

From £4 4s. upwards.

GEORGE JENNINGS,

Sanitary Engineer, Stangate, London, S.E.

By Royal Letters Patent.

McEVOY & GAYTON,

24, MOORGATE STREET, LONDON,

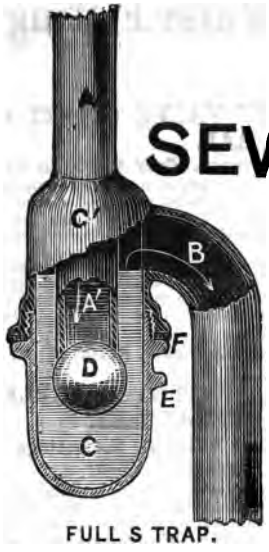
SOLE MANUFACTURERS FOR GREAT BRITAIN AND IRELAND, FRANCE, BELGIUM, AND GERMANY,

OF

THE BOWER

PATENT

SEWER GAS TRAP.



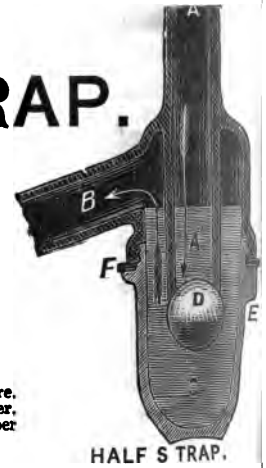
FULL S TRAP.

SIMPLE IN ITS CONSTRUCTION.

SURE IN ITS ACTION.

RETAINS NO SEDIMENT.

EXPLANATION OF THE BOWER TRAP.
A Inlet pipe connecting with lavatory or other fixture. B Outlet pipe connecting with sewer. C Cup-shaped chamber. D Floating valve. E Lug for unscrewing cup. F Rubber flange.



HALF S TRAP.

EVERY ENGINEER, ARCHITECT, PHYSICIAN, PLUMBER, AND HOUSEHOLDER

SHOULD CAREFULLY READ THE FOLLOWING

TEN POINTS, POSSESSED BY NO OTHER TRAP.

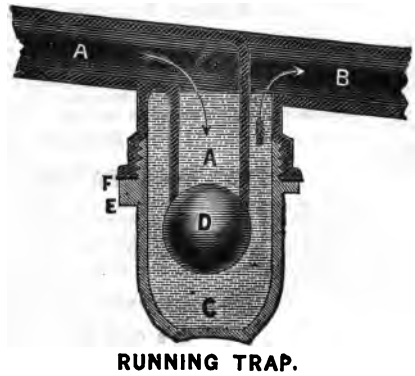
1st. Seal against Sewer Gas under Pressure.

2nd. Seal against Absorbed Gases.

3rd. Seal against Back Water.

4th. Seal is Not Broken by Siphonage.

5th. Seal is Not Broken by Evaporation.



RUNNING TRAP.

6th. Self-scouring or Cleaning.

7th. Removable Section.

8th. Glass Section, Exposing Valve Mechanism.

9th. Compression of Valve allows for Expansion by Freezing.

10th. Can be Repaired or Valve Renewed by anyone.

The BOWER TRAP is on exhibition, and may be seen in operation at 24, Moorgate-street. Prospectuses to be obtained on application.

All communications should be addressed to

McEVOY & GAYTON,
24, MOORGATE STREET,
LONDON, E.C.

A SAMPLE TRAP WILL BE FORWARDED UPON THE RECEIPT OF 14s.

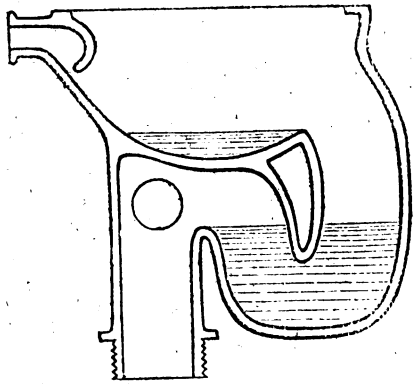
Freedom from Sewer Gas Guaranteed.

Awarded the Certificate of Merit by the British Medical Association, at their Annual Meeting, 1877.

DODD'S

PATENT VENTILATED WATER CLOSET,

WITH PATENT IMPROVED SPREADER.



SUITABLE FOR

THE MANSION,

THE VILLA,

THE COTTAGE,

THE STATION,

THE HOSPITAL,

THE SCHOOL,

THE HOTEL, &c.

INODOROUS—SIMPLE—EFFICIENT.

Will be found one of the best and most effective Water-closets ever offered to the public.

It possesses, amongst others, the following advantages over most Closets now in use:—

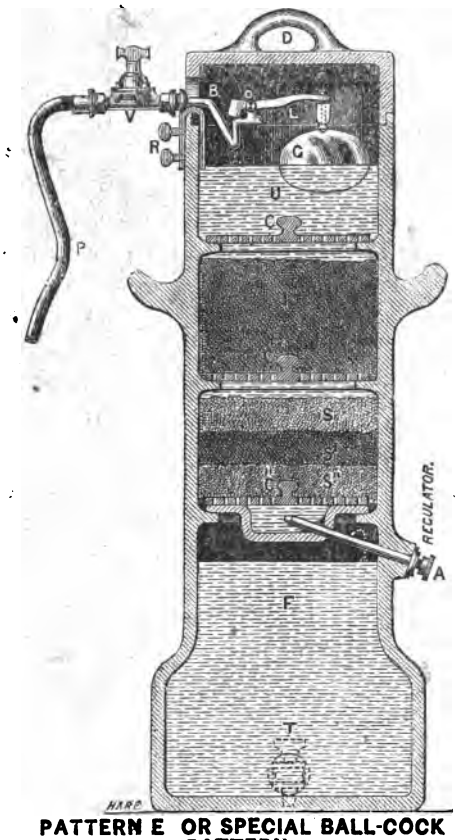
1. PERFECT VENTILATION.—The Ventilator being placed at the highest point of the soil-pipe above the trap, where the sewer gases are sure to ascend, offer a ready outlet for their escape, and prevents that inflow of noxious effluvium so common in the ordinary Pan-closet every time it is used, and thus insures perfect freedom from closet and sewer gases.
2. The Ventilating orifice being above the trap, the Closet, when in use, cannot by any means become unsiphoned or *blow*.
3. Having no valve or other mechanical apparatus, it will be found simple in the working, and not liable to get out of order.
4. In case of stoppage—a thing not likely to occur—the Ventilator may be easily removed, and affords immediate facilities for the removal of the obstruction.
5. Can be readily fixed where any other Water-closet has been, without much or any alteration of seat.

DODD'S IMPROVED LIVERPOOL STENCH-TRAP.

JOHN DODD, Sanitary Engineer, Liverpool.

BISCHOF'S

SPONGY IRON FILTER.



PATTERN E OR SPECIAL BALL-COCK PATTERN.

SPONGY IRON FILTER as now supplied to Her Majesty, the Royal Family, and the Empress of Germany.

SPONGY IRON FILTER. Officially certified as the most efficient and lasting for removing sewage, lime, and lead from water.

SPONGY IRON FILTER. See Sixth Report of the Royal Commission on Rivers Pollution, presented to Parliament, Session 1875. (Pages 220, 221.)

SPONGY IRON FILTER. See Weekly Reports of the Registrar-General, January 8th, 1876; January 6th, 1877; and February 9th, 1878.

SPONGY IRON FILTER. See Journal of the Royal Agricultural Society of England. Vol. XI., Part 1, 1875 (p. 158).

SPONGY IRON FILTER, as now supplied to the War Office, the India Office, the Admiralty, the Crown Agents for the Colonies, and the Science and Art Department, South Kensington.

SPONGY IRON FILTER. The only filter to which has been awarded the Prize Medal of the Sanitary Institute of Great Britain. President—His Grace the Duke of Northumberland, K.G.

SPONGY IRON FILTER. See Official Report of Royal Commission (p. 220) on Animal Charcoal Filters:—"Indeed, we found that myriads of minute worms were developed in the animal charcoal, and passed out with the water." No charcoal in the Spongy Iron Filter.

SPONGY IRON FILTER. See Official Report of Royal Commission (p. 220) on Animal Charcoal Filters:—"The property which animal charcoal possesses in a high degree, of favouring the growth of the low forms of organic life, is a serious drawback to its use as a filtering medium for potable waters." No charcoal in the Spongy Iron Filter.

SPONGY IRON FILTER. See Official Report of Royal Commission (p. 221) on the Spongy Iron Filter:—"The numbers in the foregoing table show, in every case, a most satisfactory reduction in the proportion of organic matter and of hardening constituents, and this after the filter had been in constant action for upwards of eight months."

SPONGY IRON FILTER. See Official Report of the Registrar-General, January 6th, 1877:—"Even this polluted water can be chemically purified by filtration through spongy iron. A Spongy Iron Filter which had been in constant use for more than a year . . . removed nearly 9-10ths of the organic matter, and more than one-half of the hardness from the water."

SPONGY IRON FILTER: can be easily re-charged with fresh filtering material by the user whenever required, without returning to the makers.

ADDRESS:—

THE SPONGY IRON WATER PURIFYING COMPANY,

505, OXFORD-STREET, LONDON, W.C.

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